U- 600075
L40-85(05-29)-L
8C.150a

ILLINOIS POWER COMPANY

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

May 29, 1985

Docket No. 50-461

Mr. James L. Milhoan
Section Chief, Licensing Section
Quality Assurance Branch
Office of Inspection and Enforcement
Mail Stop EWS-305B
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Clinton Power Station Unit #1
Independent Design Review

Dear Mr. Milhoan:

In accordance with the agreements reached in S&L's offices on May 9, 1985, attached are advance copies of the Final Safety Analysis Report (FSAR) changes which you requested. These changes have been through Illinois Power's formal review and will be incorporated into the FSAR in Amendment #34, scheduled for issuance in July, 1985. Also attached is a status report for the Observation Reports for which commitments have been made.

Illinois Power has made arrangements for Bechtel to review S&L's work on the high and medium energy line break analysis. The results of this review will be sent to you when they become available. The Bechtel review and the commitments described in the attached status report are proceeding per our discussion of May 9, 1985.

Please feel free to contact me if you have any questions concerning this material.

Sincerely yours,

D. P. Hall
Vice President

B001
1/9

DWW/lab

Attachments

cc: See attached distribution list

ENCLS TO:
PDR 1 cy
LPDR 1 cy
NSIC 1 cy
REG. FILE 1 cy
TI 1 cy
B. SIEGEL, PM 1 cy
J. MILHOAN 2 cys
MEB 1 cy

8506040538 850529
PDR ADOCK 05000461
A PDR

LTRS TO ALL

U-600075
L40-85(05-29)-L
8G.150a

Clinton Power Station

Independent Design Review
Standard Distribution List

*Director of Nuclear Reactor Regulation
Attn: Mr. W. R. Butler, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

James G. Keppler
Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Byron Siegel
Clinton Licensing Project Manager
Mail Code 416
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Fred Christianson
Mail Code V-690
NRC Resident Office
Clinton Power Station
R.R. #3, Box 228
Clinton, Illinois 61727

James L. Milhoan
Section Chief, Licensing Section
Quality Assurance Branch
Office of Inspection and Enforcement
Mail Stop EWS - 305B
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Richard C. Knop
Section Chief
Projects Section 1-C
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Richard J. Goddard, Esq.
Office of the Legal Director
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Terry Lash
Director, Illinois Department of
Nuclear Safety
1035 Outer Park Drive
Springfield, Illinois 62704

Allen Samelson, Esq.
Assistant Attorney General
Environmental Control Division
Southern Region
500 South Second Street
Springfield, Illinois 62706

Jean Foy
Spokesperson, Prairie Alliance
511 W. Nevada
Urbana, Illinois 61801

Richard Hubbard
MHB Technical Associates
1723 Hamilton Avenue
Suite K
San Jose, California 95125

Gordon L. Parkinson
Bechtel Power Corporation
Fifty Beale Street
P. O. Box 3965
San Francisco, California 94119

Roger Heider
Sargent & Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603

Ted DelGaizo
WESTEC Services Inc.
1 Meeting House Center
Suite 100
2240 Butler Pike
Plymouth Meeting, Pennsylvania 19462

Rev. 3
05/16/85

IDR ACTION ITEMS

Commitment	Description	Scheduled Date	Completion Date
OR-1	Delete 10 sec. time delay from Logic Diagram M15-1052, Sheet 3 of 6.	4/1/85	3/14/85
OR-4	Revise FSAR Chapter 3 to clarify load considerations for the Control, Diesel Generator and HVAC buildings.	5/1/85	5/9/85*
OR-5	Revise SQRT packages to include updated MAS-CQD-2.4 checklist which requires documentation of calculated vs. allowable deflection at criteria locations of active components.	12/31/85	
OR-5	Document the use of engineering judgment in EQ evaluations on checklist in SQRT package.	12/31/85	
OR-7	Revise FSAR Sec. 3.9.2.2.1.1 to agree with S&L procedures and standards.	8/1/85	
OR-9	Perform joint S&L and BA review of welding procedures for AWS D.1.1 welds.	5/1/85	
OR-9	Obtain NRC authorization of Code Case allowing use of weld sizes based on design.	7/1/85	
OR-9	Assure that contractor has ASME III qualified procedure to cover these welds, performed welds are in compliance with the qualified procedures, fabrication drawings are revised to note procedural requirements, design requirements are revised to allow use of Code Case N-413.	7/1/85	
OR-10	Review other safety-related components requiring non-interruptible power to ensure no similar condition exists.	7/1/85	
OR-10	Revise design so LOCA bypass relays energized by non-interruptible power supply.	7/1/85	
OR-11	Obtain a resolution from General Electric for terminal blocks separation.	4/15/85	3/12/85
OR-12	Revise FSAR Table 3.2-1, Item XXV.4 to include piping as well as valves.	5/1/85	5/9/85*

*See attached FSAR change pages which will be submitted in Amendment 34.

IDR ACTION ITEMS

Commitment	Description	Scheduled Date	Completion Date
OR-13	Implement hot gap check program		
	a. Inspect each whip restraint in pipe hot position to assure no contact.	7/1/86	
	b. Measure selected gaps in pipe hot position and check against design gap. Reconcile gaps larger than design by adjustment or analysis.		
OR-14	Revise FSAR Section 2.5.4.5.3 and responses to questions Q241.8, Q241.9 and Q241.10 to clarify as SSWS rather than ECCS.	5/1/85	5/9/85*
OR-15	Revise DC-SO-01-CP to reinstate Figure 7.2 for tornado surface pressure.		9/17/84
OR-17	Revise FSAR Sec. 3.9.2.2.2 to identify qual. is by dynamic tests and/or analysis.	5/1/85	5/9/85*
OR-17	Revise FSAR Sec. 1.8, compliance with Reg. Guide 1.48.	5/1/85	5/9/85*
OR-19	Incorporate into the affected Stress Reports the replacement evaluations done when snubbers were replaced with struts.	7/1/85	
OR-20	Revise the Clinton Structural Design Control Summary to clarify deflection limits.	4/1/85	4/12/85
OR-21	Revise the Design Control Summary to agree with Structural Design Standard E 37.0 to include frictional forces for all new support design.	4/1/85	4/12/85
OR-24	Correct Dynamic Qualifications Status Report to be consistent with S&L Engineering Document List.	5/1/85	
OR-24	Revise FSAR Table 3.10-1 to include strainer operators.	5/1/85	5/9/85*
OR-24	Revise FSAR Table 3.9-5 to include missing active valve numbers.	5/1/85	

*See attached FSAR change pages which will be submitted in Amendment 34.

IDR ACTION ITEMS

Commitment	Description	Scheduled Date	Completion Date
OR-28	Revise Logic Diagram M15-1052, Sh. 4.	4/1/85	3/14/85
OR-29	Resolve motor operator qualification issue with equipment vendor.	7/1/85	
OR-29	Correct Dynamic Qualification Status Report to be consistent with Engineering Documents List.	7/1/85	
OR-29	Revise S&L letter SLMI-12869 to IP regarding Equipment Seismic Assessment Program.	7/1/85	
OR-30	IP perform valve functional testing at appropriate differential pressures.	1/1/86	
OR-30	Revise FSAR Sec. 3.9.3.2.2.2 to remove testing at design differential pressure.	5/1/85	5/9/85*
OR-33	Revise generic checklist, Tab A, Item F4.7.6 of EQ Binder EQ-CL041 to clarify parameter accuracy.	7/1/85	
OR-33	Revise generic checklist, Tab C, Item F4.7.6 of Binder EQ-CL012 to include justification for voltage and frequency variations.	7/1/85	
OR-33	Review checklist Section F4.7.6 or its equivalent for all Class 1E EQ packages to ensure accuracy.	9/1/85	
OR-34	Consider weir swell impact loads for valve 1RF019 and froth impact pressure for valve 10RF020 in their seismic evaluation.	8/1/85	
OR-39	Revise S&L Technical Monitoring Standards to require documented discipline coordination.	[illegible]/1/85	
OR-43	Revise FSAR Section 6.1.1.1.1 to indicate that the corrosion allowance is 0.08 inch for buried and zero for non-buried ferritic SSW.	5/1/85	5/9/85*
OR-43	Correct Dwg. M06-1052, Sh. 6 and Penetration Schedule Dwg. M03-1101.	6/1/85	

*See attached FSAR change pages which will be submitted in Amendment 34.

IDR ACTION ITEMS

Commitment	Description	Scheduled Date	Completion Date
OR-43	Recommend BA correct Dwg. M06-1052, Sh. 6.	7/15/85	
OR-46	Revise calculation 19AN-14 to include undervoltage relay settings.	5/15/85	
OR-46	Revise FSAR for modificaiton to breaker interlock and bus undervoltage.	8/1/85	
OR-48	Revise FSAR Sec. 6.1.1.1.1 to delete the requirement for the 0.08 in. corrosion allowance except for buried ferritic piping.	5/1/85	5/9/85*
OR-55	Implement a program for reviewing future design changes for the effects of pipe breaks.	5/1/85	
OR-54	Augment existing DG equipment qualification with results of Navy shock testing on DG.	8/1/85	
OR-54	Obtain qualification report for DG heat exchangers from S&S for review by S&L.	8/1/85	
OR-55	Prepare calculations documenting HELB-Outside Containment engineering evaluations.	6/15/85	
OR-55	Prepare a summary report of the HELB-analysis suitable for independent adequacy verification.	6/15/85	
OR-55	Revise FSAR section on pipe breaks to include revised commitments and/or analysis results.	8/1/85	
OR-57	Revise Calc 01ME04 to include additional clarifying information.	5/1/85	
OR-57	Prepare supplemental Calc. 01ME43 to complete MELB analysis on areas not yet evaluated.	5/1/85	
OR-57	Implement a program for reviewing future design changes for the effects of pipe breaks.	5/1/85	
OR-57	Prepare a summary report of MELB analysis suitable for independent adequacy verification.	6/15/85	

*See attached FSAR change pages which will be submitted in Amendment 34.

IDR ACTION ITEMS

Commitment	Description	Scheduled Date	Completion Date
OR-57	Revise FSAR to document MELB analysis	8/1/85	
OR-57	Perform MELB evaluation for changes made after July, 1982.	9/1/85	
OR-59	Revise design documents to reflect vendor value of 4.8 ohm.	7/1/85	
OR-59	IP to refer 4.8 ohm concern to GE for their review.	7/1/85	
OR-63	Revise FSAR Sec. 8.3.1.1.2 to clarify actual DG loading design.	8/1/85	
OR-64	Implement a program for reviewing future design changes for the effects of pipe breaks.	5/1/85	
OR-64	Revise FSAR Sec. D.3.6.3.5 to agree with design drawings.	8/1/85	
OR-64	Revise FSAR Sec. 3.11.9 to clarify "Submergence or Spray" section.	8/1/85	
OR-64	Prepare a summary report of flooding analysis suitable for independent adequacy verification.	9/1/85	
OR-64	Revise documents to reflect revised parameters.	9/1/85	
OR-64	Prepare a supplement to Flooding Design Criteria DC-ME-01-CP to support conclusions stated in the criteria.	9/1/85	
OR-67	Issue ECN to revise K-2882 to correct code case reference to N-121.		11/20/84
OR-69	Void valve data sheet MO-523.	5/1/85	4/24/85
OR-69	Revise column 10 of Valve List to show valve 1SX217 as passive.	5/1/85	4/24/85
OR-69	Revise FSAR 3.9-5 to delete valve 1SX217.	5/1/85	
OR-70	Complete review for approval of Structural Design Standard SDS-E9, which contains a revised equation for unbalanced forces.	5/1/85	

IDR ACTION ITEMS

Commitment	Description	Scheduled Date	Completion Date
OR-70	Revise FSAR Sec. 3.8.5.4 to clarify the intent of the 2.5 mass ratio.	5/1/85	5/9/85*
OR-71	Update Structural Design Criteria DS-SD-01-CP to delete manual plotting.	4/1/85	4/12/85
OR-72	Revise FSAR 9.2-3 to give correct value for auxiliary heat load.	5/1/85	5/9/85*
OR-73	Implement a program for reviewing future design changes for the effects of pipe breaks.	5/1/85	
OR-73	Revise FSAR Sec. 3.6 to reference NUREG/CR-2913 and to include final break/restraint locations, and review locations for consistency with the current design.	5/1/85	4/3/85
OR-73	Issue summary report explaining the methodology and analysis for HELB design process suitable for independent adequacy verification.	6/15/85	
OR-73	Perform HELB evaluation for changes made after July 1982.	9/1/85	
OR-74	Obtain vendor documentation substantiating that check valve operability is not affected by actuator deflections during and after a seismic event.	10/1/85	
OR-75	Revise FSAR Sec. 3.8.4.4 to delete the 0.002 in/in limit.	5/1/85	5/9/85*
OR-77	Confirm revised GE BWR documentation on maximum voltage of 133%.	7/1/85	
OR-79	Revise FSAR Sec. 3.9.3.2.2.1 to remove requirements that valves be tested at design differential pressure.	5/1/85	5/9/85*
OR-79	Revise FSAR Sec. 3.9.3.2.2.1 to remove outdated ASME Code requirement.	5/1/85	
OR-79	Revise FSAR Sec. 3.9.3.2.2.1 to delete requirements for seismic testing of pneumatic operators.	5/1/85	
OR-79	Revise FSAR Sec. 3.9.3.2.2.1 to reflect S&L position on pump seal leakage.	5/1/85	

*See attached FSAR change pages which will be submitted in Amendment 34.

IDR ACTION ITEMS

Completion	Description	Scheduled Date	Completion Date
OR-79	Obtain vendor data on environmental qualification of air actuators.	7/1/85	
OR-80	Obtain updated Code Package sheets demonstrating adequate valve wall thickness.	7/1/85	
OR-81	Update seismic qualification reports to meet requirements of new checklist and to document the use of engineering judgement. Specifically, this will be done for the SSW pumps using the results of Calc CQD-017199 in the updated report.	7/1/85	
OR-82	Supplement the 480V substation vendor instruction manual to clarify the requirements for use of enclosure heater during periods of extended shutdown to prevent condensation.	6/1/85	
OR-83	Revise FSAR 3.5-6 to give proper CWSH roof thickness.	5/1/85	5/9/85*
OR-84	Perform review of containment penetration stress reports to confirm that stresses are within both Bechtel and S&L code interpretations for all future penetration stress reports.	7/1/85	

*See Attached FSAR change pages which will be submitted in Amendment 34.

The following advanced copies of the Final Safety Analysis Report (FSAR) changes address commitments made for the following Observation Reports:

Observation Report Number	FSAR Section
4	3.8
12	3.2
14	2.5
15	Q220.01
17	1.8
17	3.9.2.2
24	3.10
30	3.9.3
43	6.1
48	6.1
70	3.8.5
72	9.2
73	3.6
75	3.8.4
79	3.9.3
83	3.5

Regulatory Guide 1.48, Rev. 0 (May 1973)

Design Limits and Load Combinations
for Seismic Category 1 Fluid System Components

Project Position - Comply with stress limits for Active Components with the following exception:

> The operability requirements for all active components will be assured by performing a detailed deformation analysis and/or by performing a seismic test. Therefore, the allowable stress limits that shall be used for each category shall be in conformance with the applicable ASME Codes.

FSAR Section - 3.9

2.5.4.5.3 SSWS Outlet Structure and Pipelines

2.5.4.5.3.1 Site Preparation

Site preparation and earthwork for the shutdown service water system (SSWS) outlet structure and pipelines consisted of the same operations as described in Subsection 2.5.4.5.1.1.

2.5.4.5.3.2 Excavation

The excavation for the SSWS outlet structure extended from the existing grade to the Illinoian till of the unaltered Glasford Formation approximately at elevation 655 feet. The excavated slopes from elevation 655 feet to 662 feet were near vertical and were approximately 5 feet from the structure itself. The slopes above elevation 662 feet were cut back on a 2:1 (horizontal to vertical) for construction purposes. The final slope configuration around the SSWS outlet structure is discussed in Subsection 2.5.5.1.2. The excavation and structural fill placed beneath the structure is illustrated in Figure 2.5-381.

Excavation was performed along the SSWS pipeline alignments between the screen house and the station site and between the outlet structure and the station site. A longitudinal subsoil profile along the SSWS pipeline is presented in Figures 2.5-486 and 2.5-487. Typical transverse sections illustrating the concrete mudmat, flyash mixture, pipe, and backfill materials are shown on Figure 2.5-488. Zones of soft and loose material were removed as indicated by overexcavation beneath the pipeline as shown on Figures 2.5-486 and 2.5-487. (Overexcavation is considered to be any excavation greater than 1.5 feet below the bottom of the lower pipe.) Minor seepage into the pipeline excavation was pumped as it became necessary. This excavation was normally dry after rain.

2.5.4.5.3.3 Dewatering

Minor seepage into the excavation was diverted around the outer limits of the outlet structure excavation by open ditches. The water was drained by gravity away from the excavation into a larger collector ditch from which the water was pumped as necessary.

2.5.4.5.3.4 Excavation Base Treatment

The base of the excavation for the SSWS outlet structure was established on sound Illinoian till. Pockets of loose material were removed prior to subgrade testing and approval.

A concrete mud mat, with a minimum thickness of 4 inches, was placed on the approved subgrade for the outlet structure to protect it from exposure.

A concrete mud mat having a minimum thickness of 4 inches was placed beneath the SSWS pipeline either over the approved subgrade or structural fill along the pipeline.

2.5.4.5.3.5 Structural Fill and Backfill

Type B granular fill material, as discussed in Subsection 2.5.4.5.1.5, was placed as structural fill directly over the mud mat beneath the outlet structure from approximately elevation 655 feet to 662 feet. This material was placed in near horizontal lifts with a maximum loose thickness of 12 inches. An analysis was performed on the 15 in-place density tests performed on the Type B granular fill. The dry density of this material ranged from 127.4 PCF to 134.2 PCF with an average dry density of 131.1 PCF. Figure 2.5-466 shows the distribution of the dry density test results. The relative density, as determined by ASTM D-2049, ranged from 89.8% to 99.6% with an average relative density of 94.9%. Figure 2.5-467 shows the distribution of the relative density test results. All of these tests met the acceptance criteria of a minimum of 85% relative density. A thin concrete seal was placed over the Type B material to protect it from runoff water.

Between the elevations of 662 feet and 669 feet, flyash mixture backfill was placed and tested as described in Subsection 2.5.4.5.1.4. A 12-inch thick apron of the flyash mixture backfill was also placed along the two side walls of the outlet structure. Four in-place strength tests were performed on the flyash mixture beneath the SSWS outlet structure. The maximum deflection was 0.022 inches for a load of 63.6 psi. This is less than the allowable deflection of 0.25 inches for a 50 psi load.

A total of 24 in-place tests were performed on the flyash mixture placed along the SSWS pipeline. A load of 71.7 psi was used for all of these tests with a maximum deflection of 0.174 inches being recorded. Therefore, the tests performed for the SSWS pipeline and outlet structure are acceptable.

Flyash mixture backfill was placed around the SSWS piping as shown on Figure 3 of Question 241.8. Structural backfill was then placed and compacted over the pipes.

Type B granular material was used as fill around the lower pipes immediately adjacent to the main plant structures. A summary of the 59 in-place tests performed in this area was made to summarize the data. The dry density of this fill ranged from 121.6 PCF to 132.7 PCF with an average value of 126.6 PCF. Figure 2.5-471 shows the distribution of the dry density test results. Figure 2.5-472 shows the distribution of the relative density test results. The relative density ranged from 85.6% to 118.0% with an average value of 100.8%. All of these tests met the acceptance criteria of 85% relative density.

Cohesive material was used as fill around the SSWS pipeline in all the remaining areas. An analysis of the 523 in-place tests taken on the cohesive material was performed to summarize the data. Figure 2.5-473 shows the distribution of the dry density test results. The dry density ranged from 116.2 PCF to 133.8 PCF with an average dry density of 122.3 PCF. Figure 2.5-474 shows the distribution of the moisture content for the tests. The moisture content ranged from 6.2% to 14.2% with an average value of 11.1%. Figure 2.5-475 shows the distribution for the percent compaction. The percent compaction ranged from 89.1% to 101.0% with an average value of 94.3%. Only seven of the 523 in-place density tests did not meet the acceptance criteria for percent compaction of this fill material. One of these tests also did not meet the moisture acceptance criteria. These failing tests represent 1.3% of the tests performed for the pipeline. As previously stated, the lowest percent compaction recorded was 89.1%. Also, these seven failing tests represent only isolated areas along the pipeline. Therefore, the material represented by these tests will not be detrimental to the integrity of the pipeline fill.

Section C-C on Figure 2.5-488 illustrates the use of the flyash mixture as it was placed within 15 feet of the bends in the SSWS pipeline. The flyash mixture was used as bedding and placed vertically up to 1/6 of the diameter of the pipe. Styrofoam, 6 inches in thickness, was placed between the flyash mixture bedding to make the bedding for each pipe independent of each other. Structural cohesive fill and backfill was then placed and compacted as previously discussed.

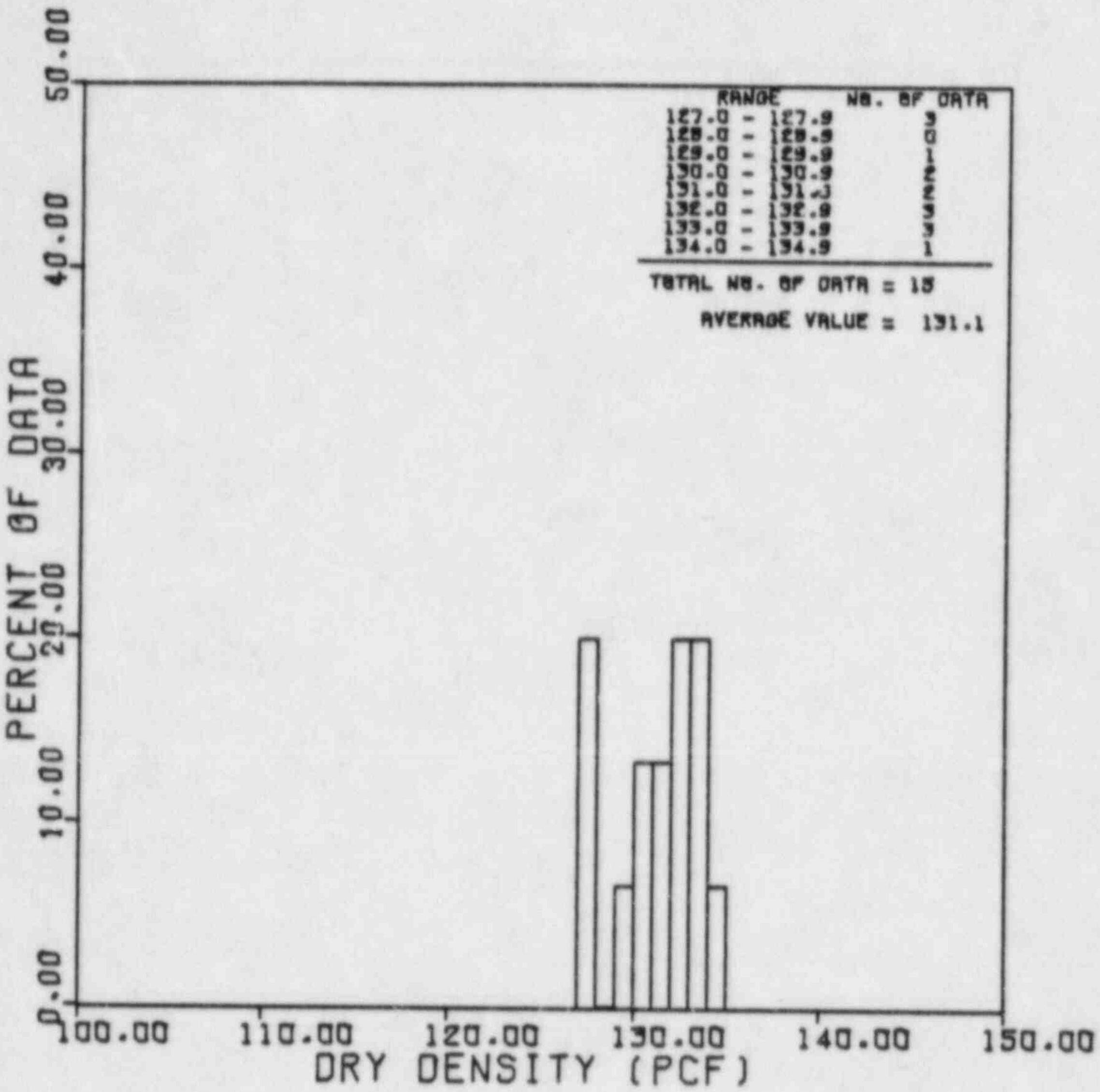
2.5.4.6 Groundwater Conditions

A discussion of the history of the groundwater conditions, monitoring of piezometers, and groundwater conditions used in analyses is presented in Subsection 2.4.13.

A discussion of the control of groundwater and seepage in the open excavations is presented in Subsections 2.5.4.5.1.3, 2.5.4.5.2.3, and 2.5.4.5.3.3 for the main plant, screen house, and outlet structure, respectively.

2.5.4.7 Response of Soil and Rock to Dynamic Loading

The parameters utilized on soil-rock-structure interaction analyses are presented in Table 2.5-48. The static soil properties presented in this table were based on evaluation of laboratory consolidation and triaxial test data. The strain dependent dynamic moduli and damping values were evaluated on the basis of geophysical results and laboratory dynamic triaxial and resonant column tests. The selected design parameters reflect both the results of the tests performed during the PSAR investigation and properties previously developed for similar soils.

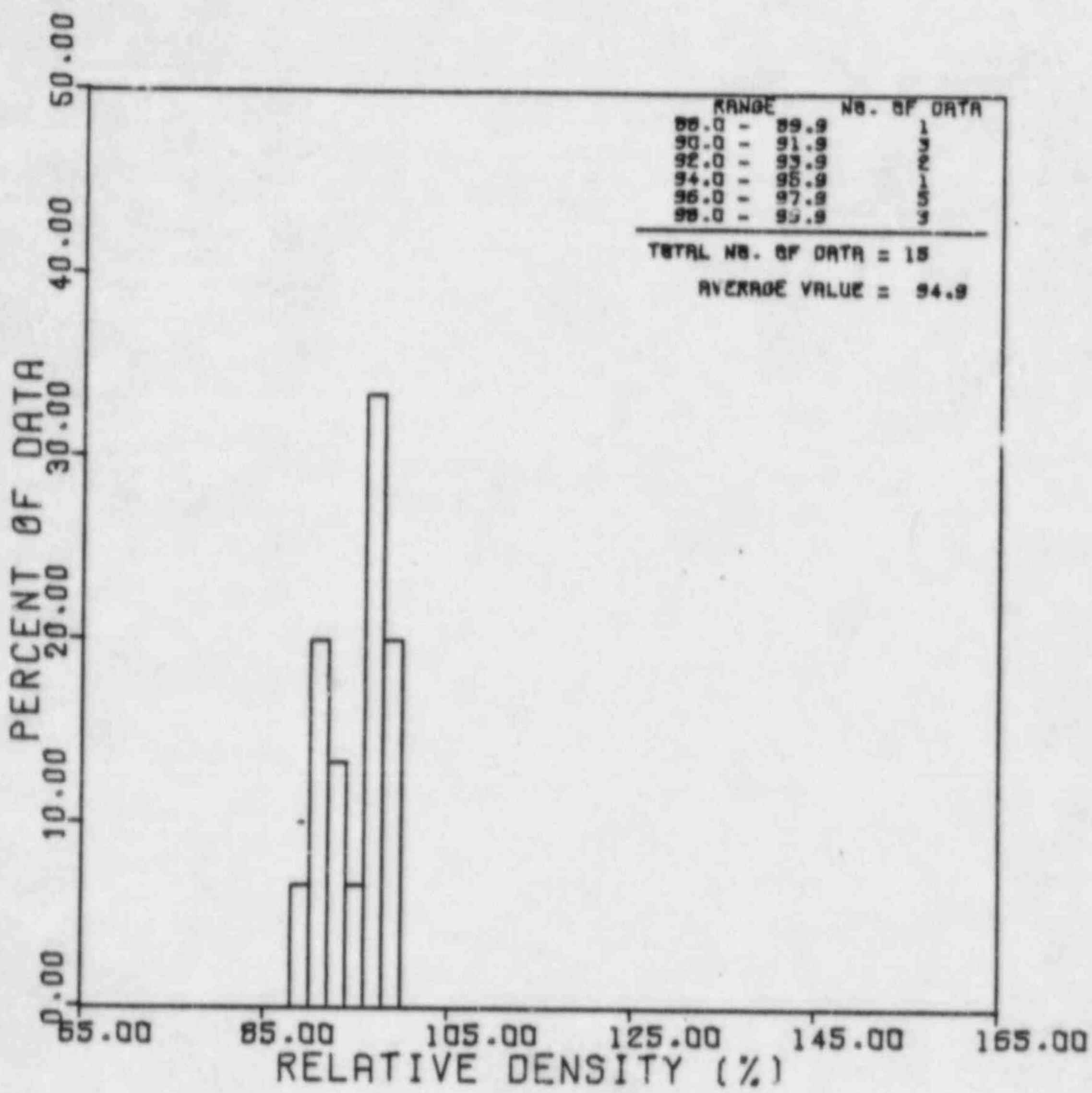


CLINTON POWER STATION
ALL DATA
OUTLET - P & R SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-466

SSWS OUTLET STRUCTURE
GRANULAR FILL - DISTRIBUTION OF
DRY DENSITY

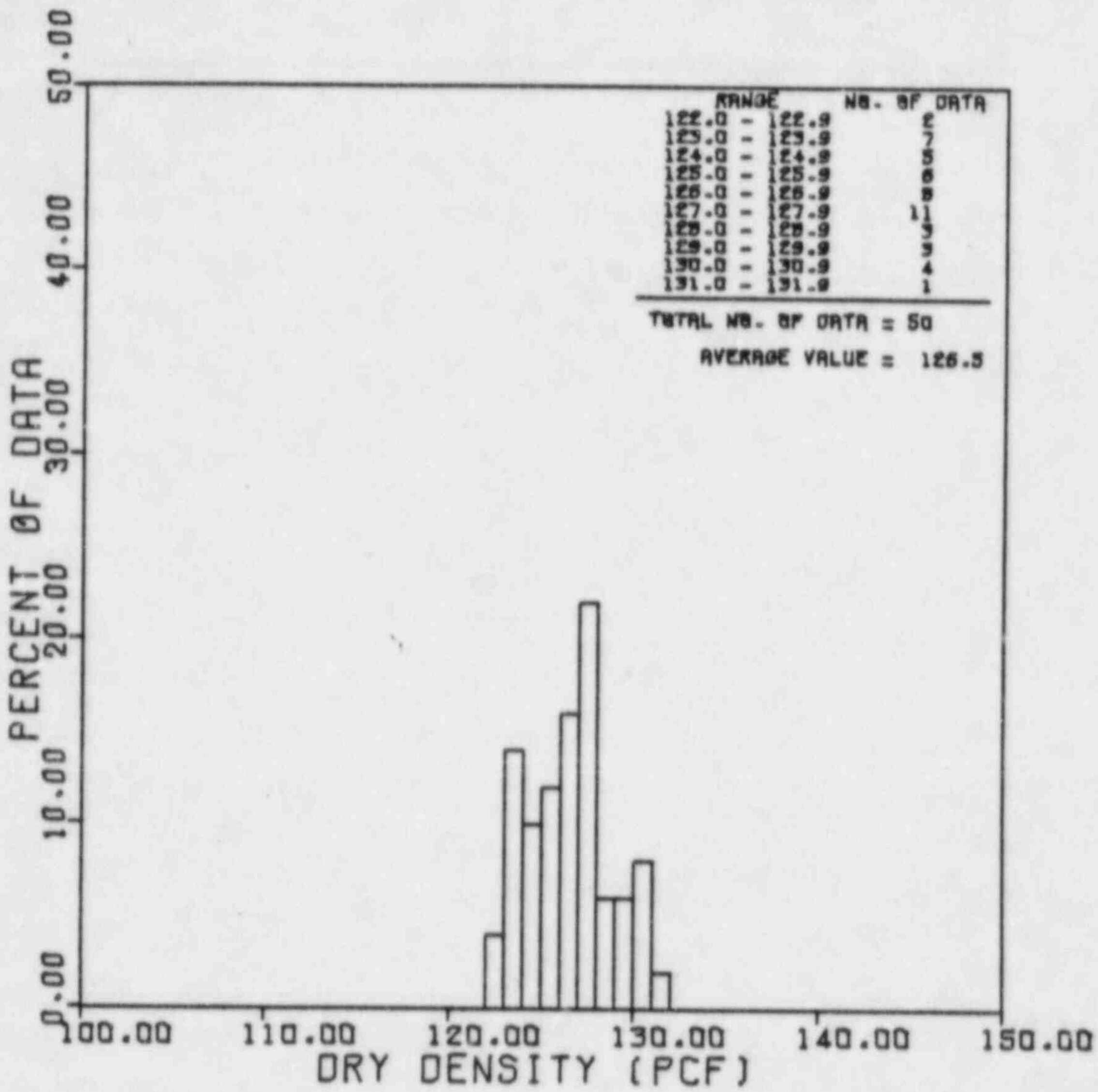


CLINTON POWER STATION
ALL DATA
OUTLET - P & R SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

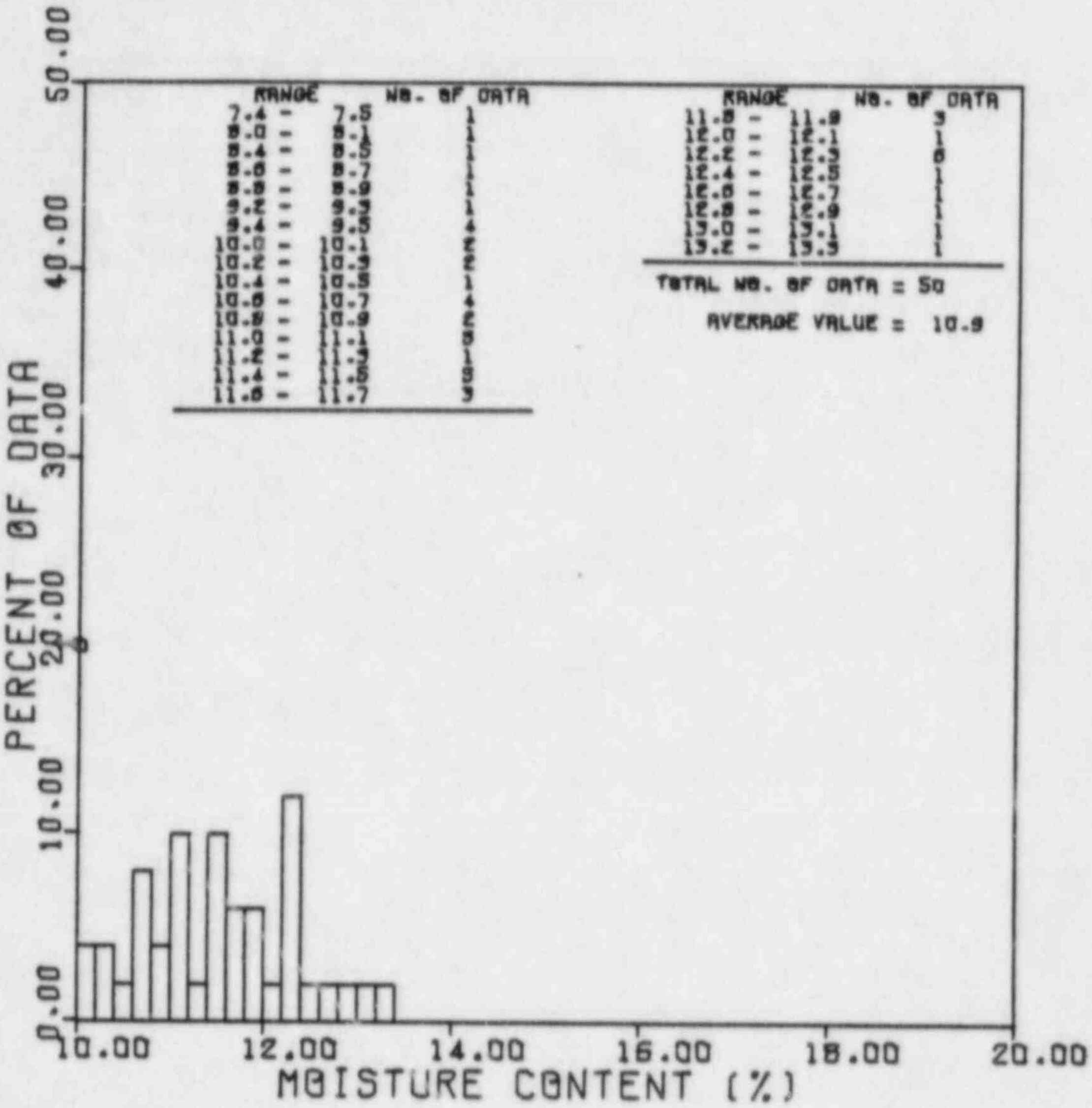
FIGURE 2.5-467

SSWS OUTLET STRUCTURE
GRANULAR FILL - DISTRIBUTION OF
RELATIVE DENSITY



CLINTON POWER STATION
ALL DATA
PIPELINE - PB SERIES

CLINTON POWER STATION FINAL SAFETY ANALYSIS REPORT
FIGURE 2.5-468 SSWS OUTLET STRUCTURE COHESIVE BACKFILL - DISTRIBUTION OF DRY DENSITY

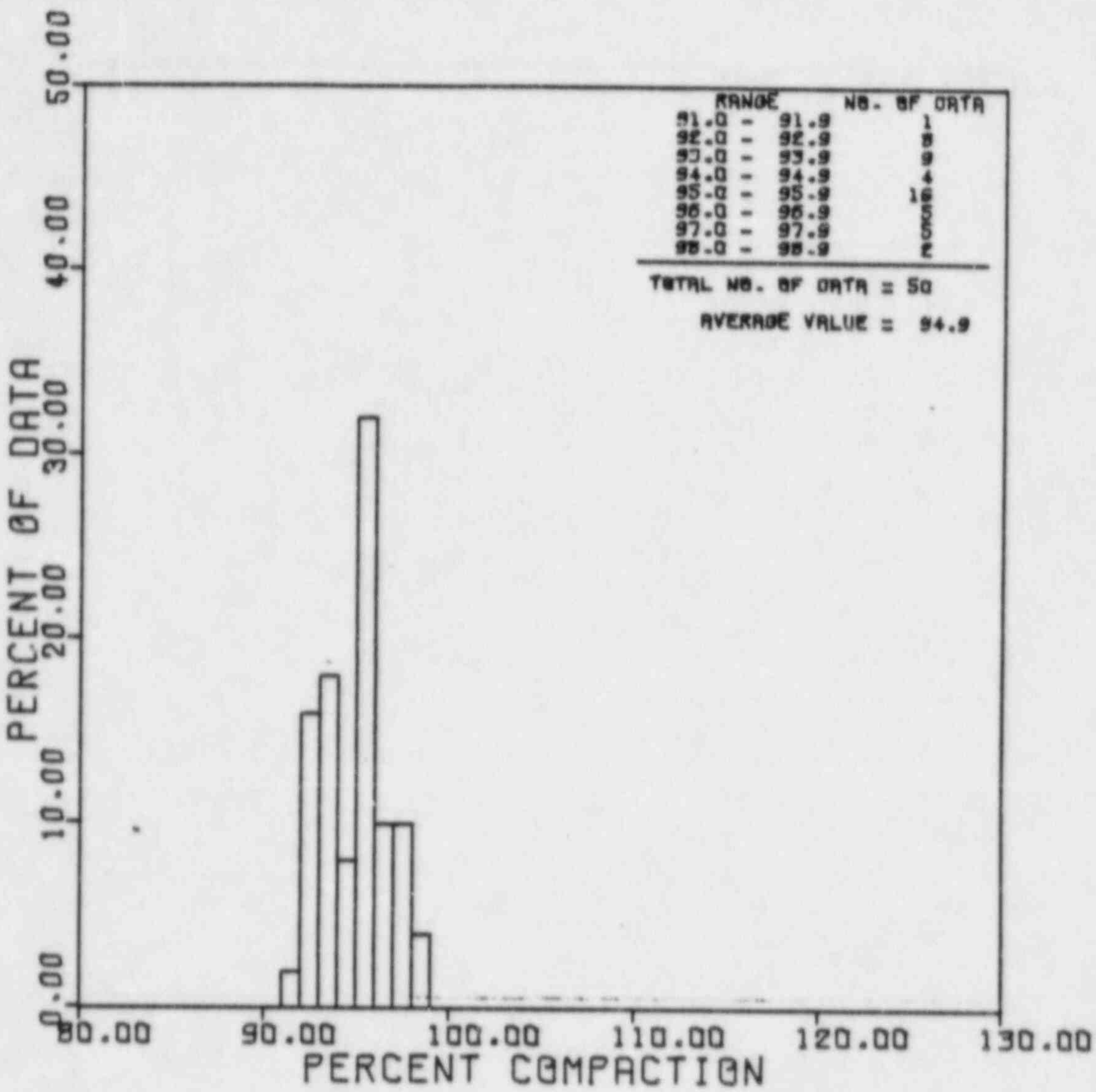


CLINTØN POWER STATIØN
ALL DATA
PIPELINE - PB SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-469

SSWS OUTLET STRUCTURE
COHESIVE BACKFILL - DISTRIBUTION OF
MOISTURE CONTENT

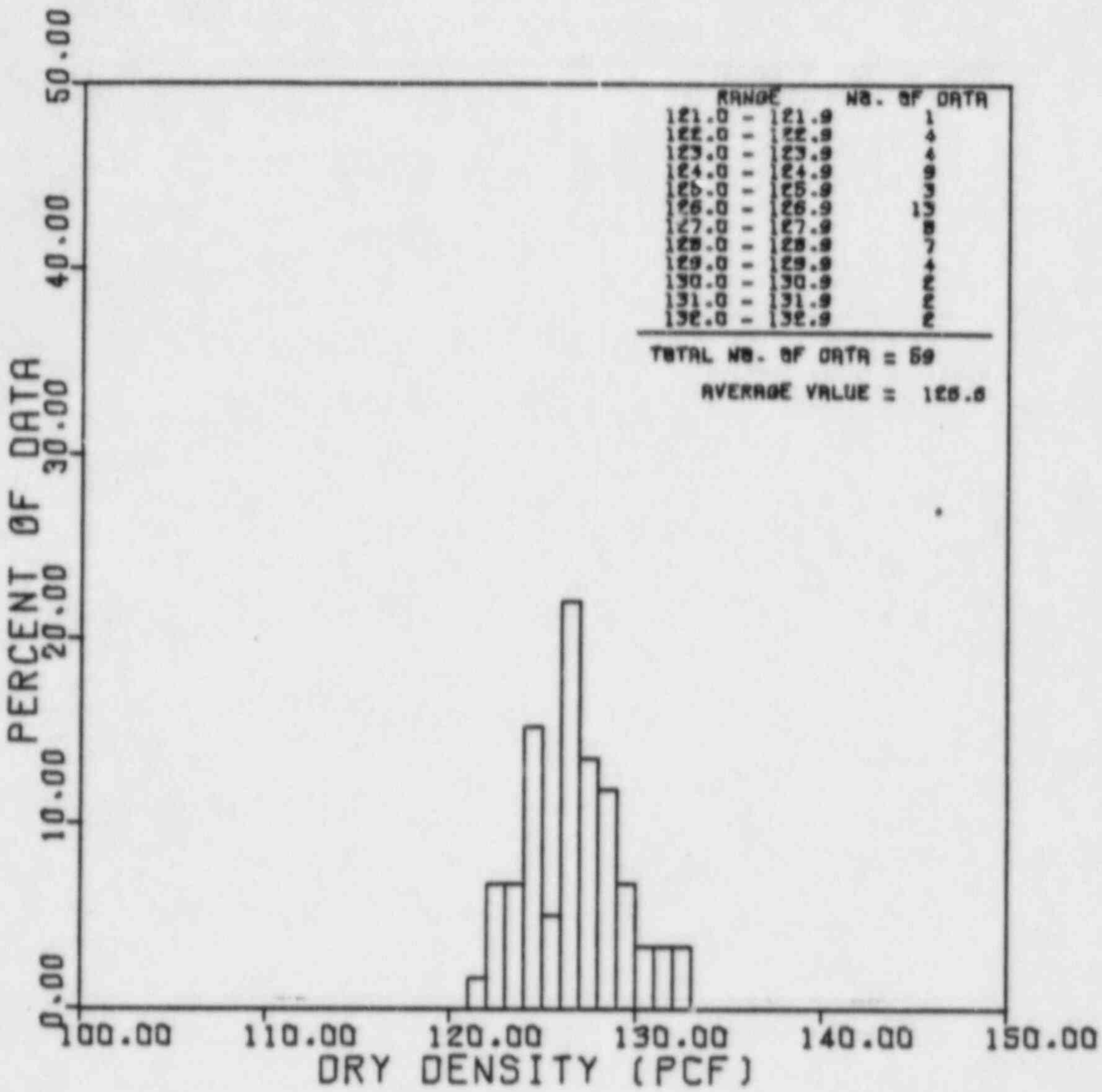


CLINTON POWER STATION
ALL DATA
PIPELINE - PB SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-470

SSWS OUTLET STRUCTURE
COHESIVE BACKFILL - DISTRIBUTION OF
PERCENT COMPACTION

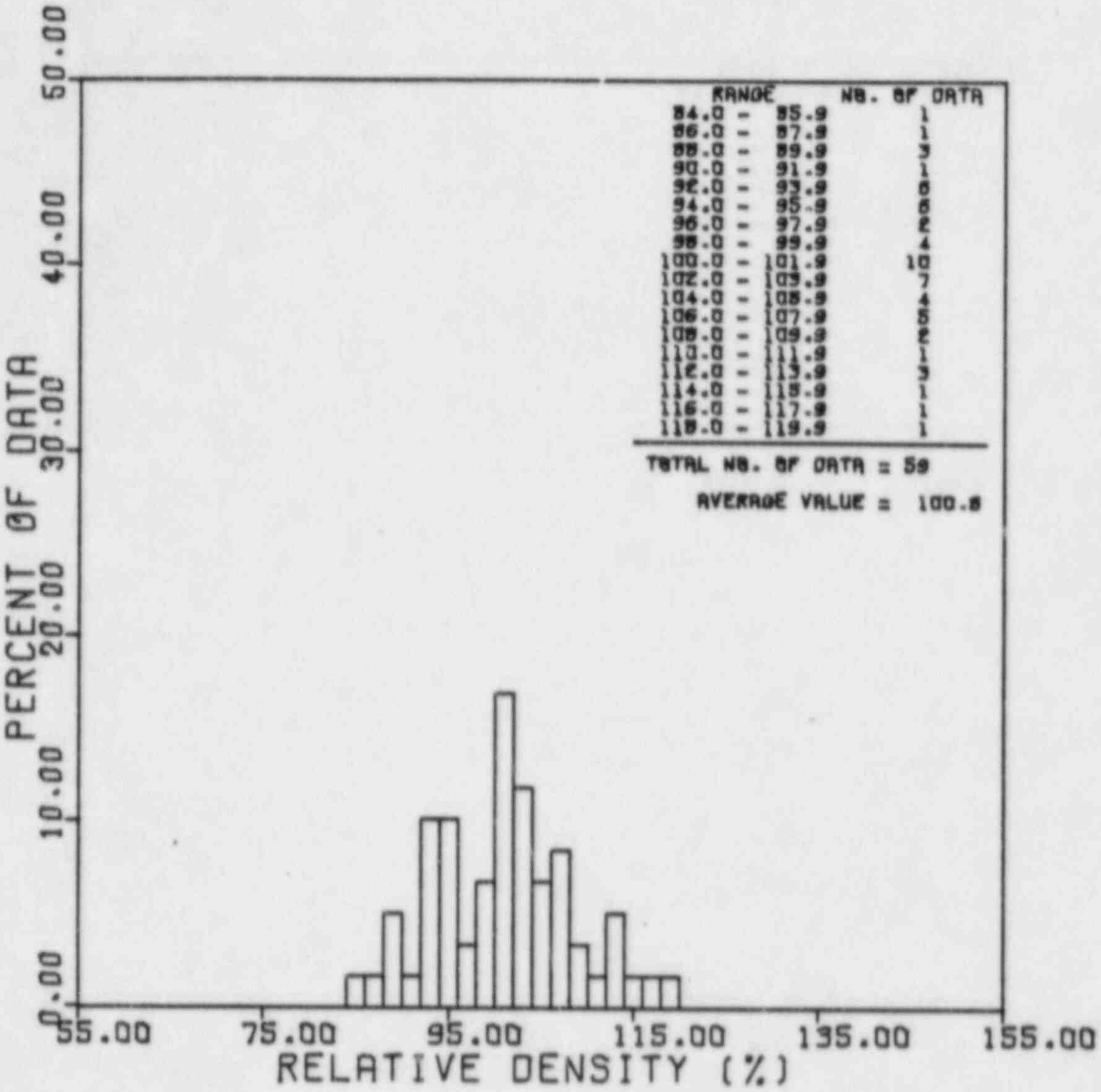


CLINTON POWER STATION
ALL DATA
PIPELINE - P SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-471

SSWS PIPELINE GRANULAR FILL - DISTRIBUTION OF DRY DENSITY



RANGE	NO. OF DATA
84.0 - 85.9	1
86.0 - 87.9	1
88.0 - 89.9	3
90.0 - 91.9	1
92.0 - 93.9	6
94.0 - 95.9	6
96.0 - 97.9	2
98.0 - 99.9	4
100.0 - 101.9	10
102.0 - 103.9	7
104.0 - 105.9	4
106.0 - 107.9	5
108.0 - 109.9	2
110.0 - 111.9	1
112.0 - 113.9	3
114.0 - 115.9	1
116.0 - 117.9	1
118.0 - 119.9	1

TOTAL NO. OF DATA = 59

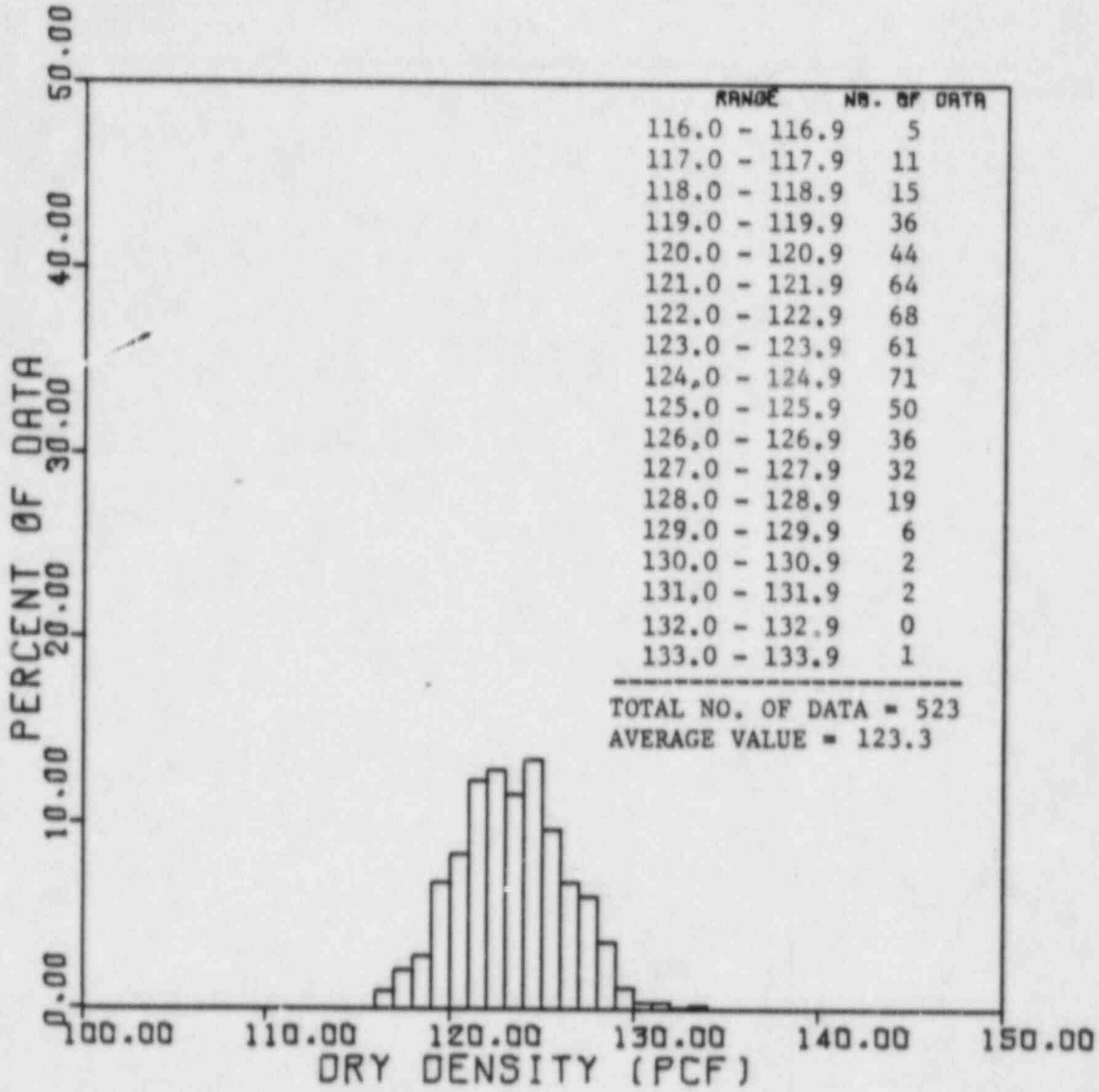
AVERAGE VALUE = 100.8

CLINTON POWER STATION
ALL DATA
PIPELINE - P SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

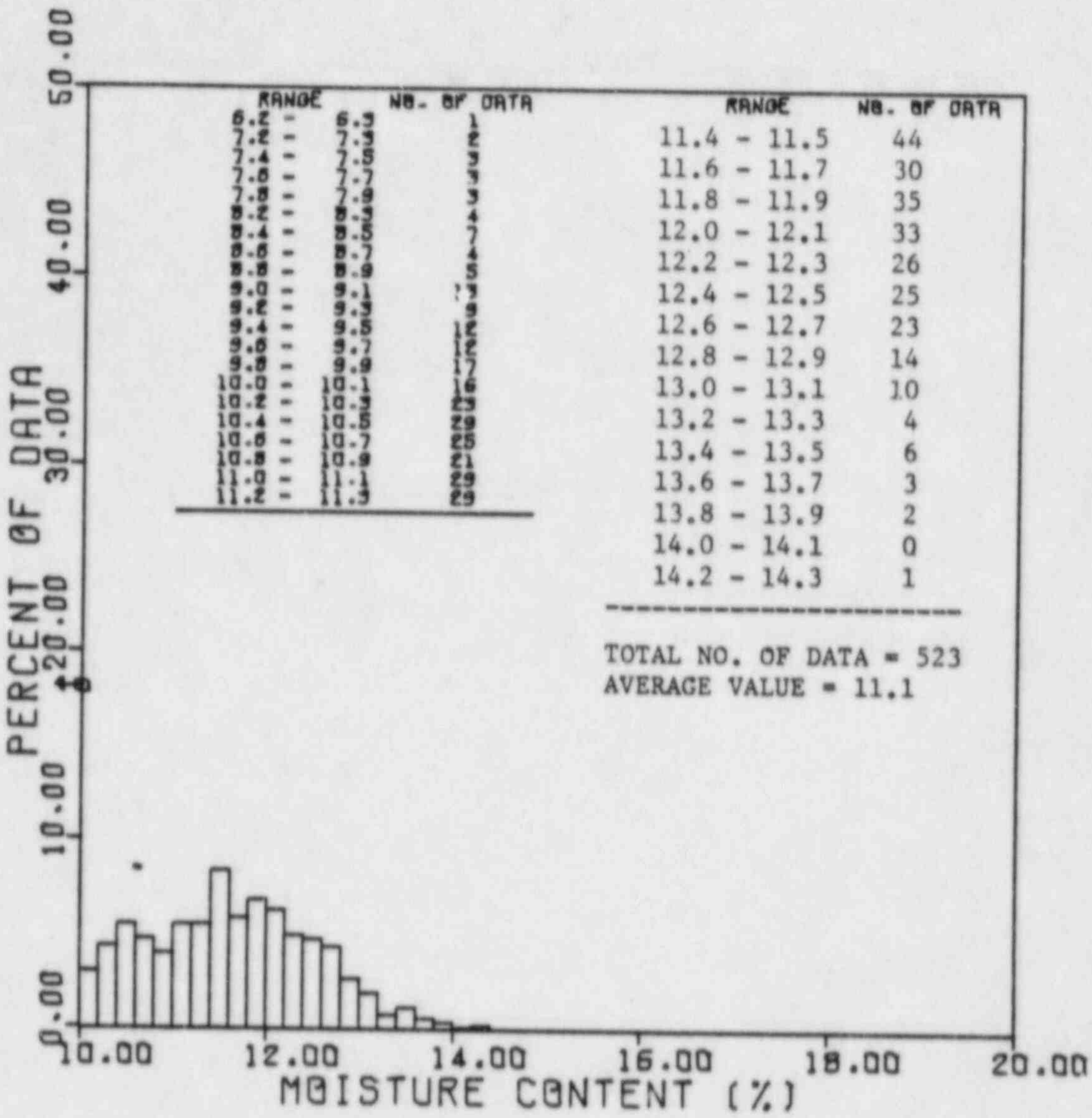
FIGURE 2.5-472

SSWS PIPELINE GRANULAR FILL -
DISTRIBUTION OF RELATIVE DENSITY



CLINTON POWER STATION
ALL DATA
PIPELINE - PB SERIES

CLINTON POWER STATION FINAL SAFETY ANALYSIS REPORT
FIGURE 2.5-473 SSWS PIPELINE COHESIVE FILL - DISTRIBUTION OF DRY DENSITY



RANGE	NO. OF DATA
6.2 - 6.3	1
7.2 - 7.3	2
7.4 - 7.5	3
7.6 - 7.7	3
7.8 - 7.9	3
8.2 - 8.3	4
8.4 - 8.5	7
8.6 - 8.7	4
8.8 - 8.9	5
9.0 - 9.1	13
9.2 - 9.3	9
9.4 - 9.5	12
9.6 - 9.7	12
9.8 - 9.9	17
10.0 - 10.1	16
10.2 - 10.3	23
10.4 - 10.5	29
10.6 - 10.7	25
10.8 - 10.9	21
11.0 - 11.1	29
11.2 - 11.3	29

RANGE	NO. OF DATA
11.4 - 11.5	44
11.6 - 11.7	30
11.8 - 11.9	35
12.0 - 12.1	33
12.2 - 12.3	26
12.4 - 12.5	25
12.6 - 12.7	23
12.8 - 12.9	14
13.0 - 13.1	10
13.2 - 13.3	4
13.4 - 13.5	6
13.6 - 13.7	3
13.8 - 13.9	2
14.0 - 14.1	0
14.2 - 14.3	1

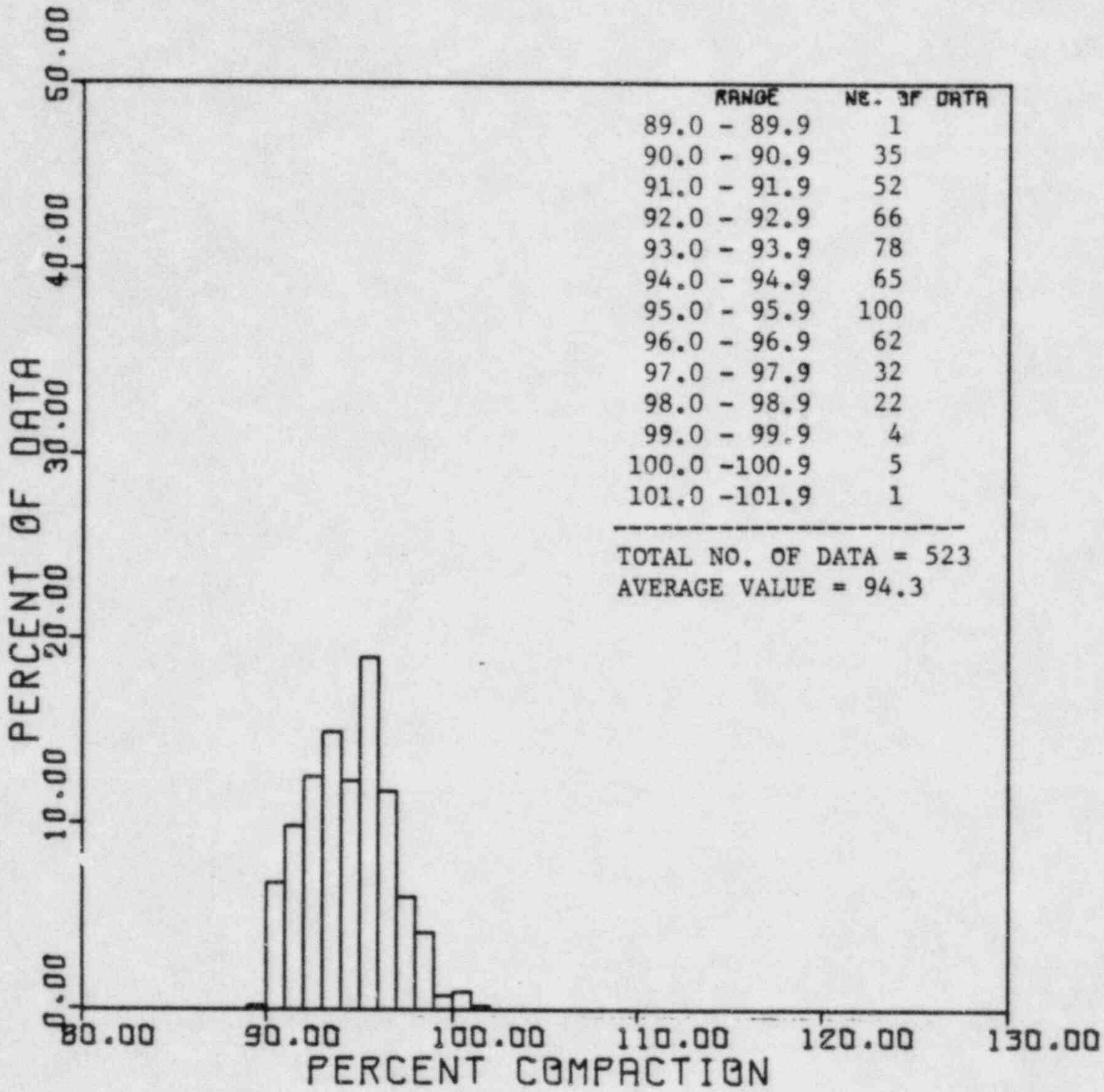
TOTAL NO. OF DATA = 523
AVERAGE VALUE = 11.1

CLINTON POWER STATION
ALL DATA
PIPELINE - PB SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-474

SSWS PIPELINE COHESIVE FILL -
DISTRIBUTION OF MOISTURE CONTENT

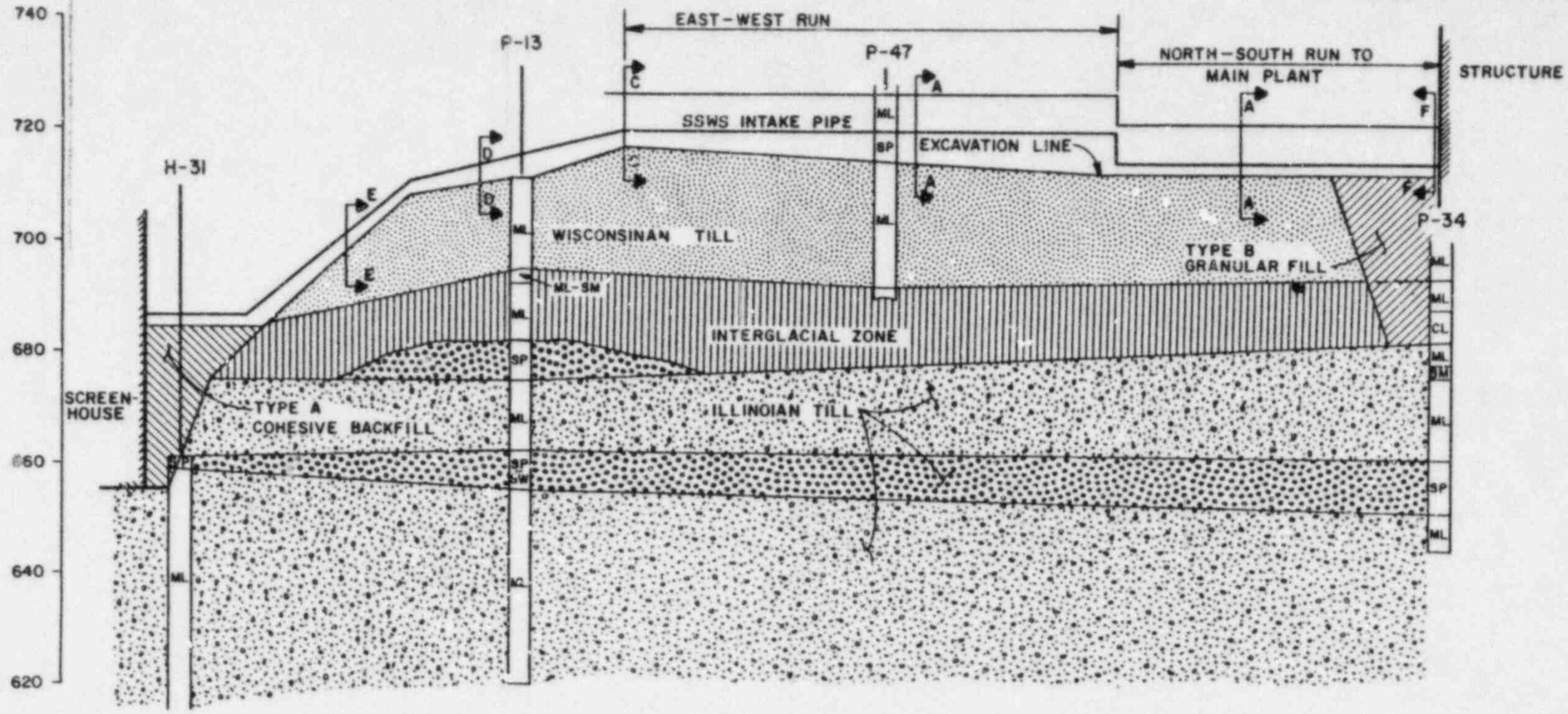


CLINTON POWER STATION
ALL DATA
PIPELINE - PB SERIES

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

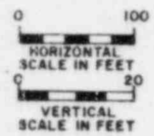
FIGURE 2.5-475

SSWS PIPELINE COHESIVE FILL -
DISTRIBUTION OF PERCENT COMPACTION



NOTES

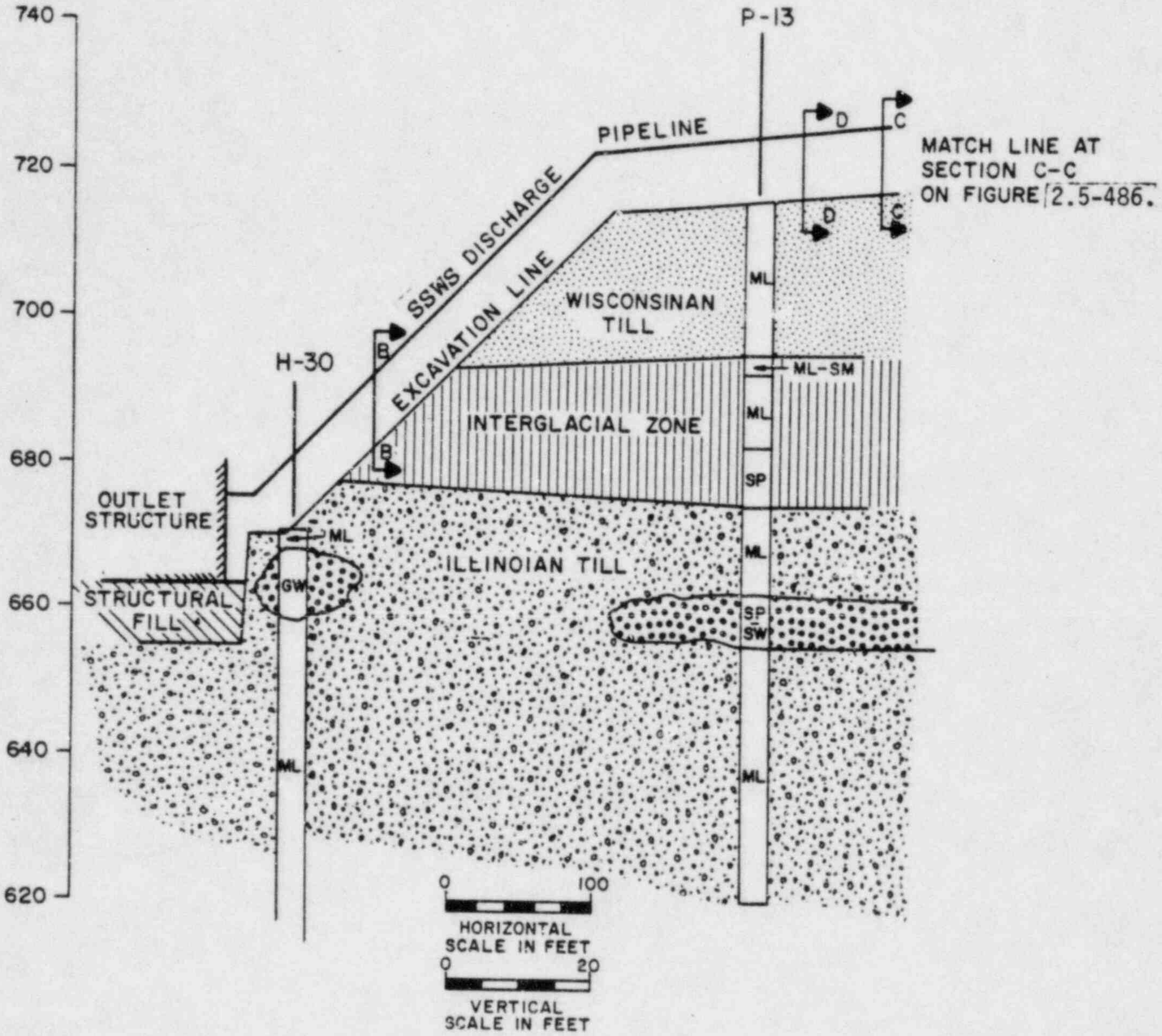
1. REFER TO FSAR FIGURE 2.5-372 FOR GEOLOGIC SECTION BELOW ELEVATION 620 FEET.
2. SEE FIGURE C2.5-23 FOR PLAN VIEW OF SSWS PIPELINE EXCAVATION.
3. SECTIONS SHOWN ON FIGURE 2.5-488.



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-486

GEOLOGIC PROFILE ALONG SSWS PIPELINE - SCREENHOUSE TO MAIN PLANT

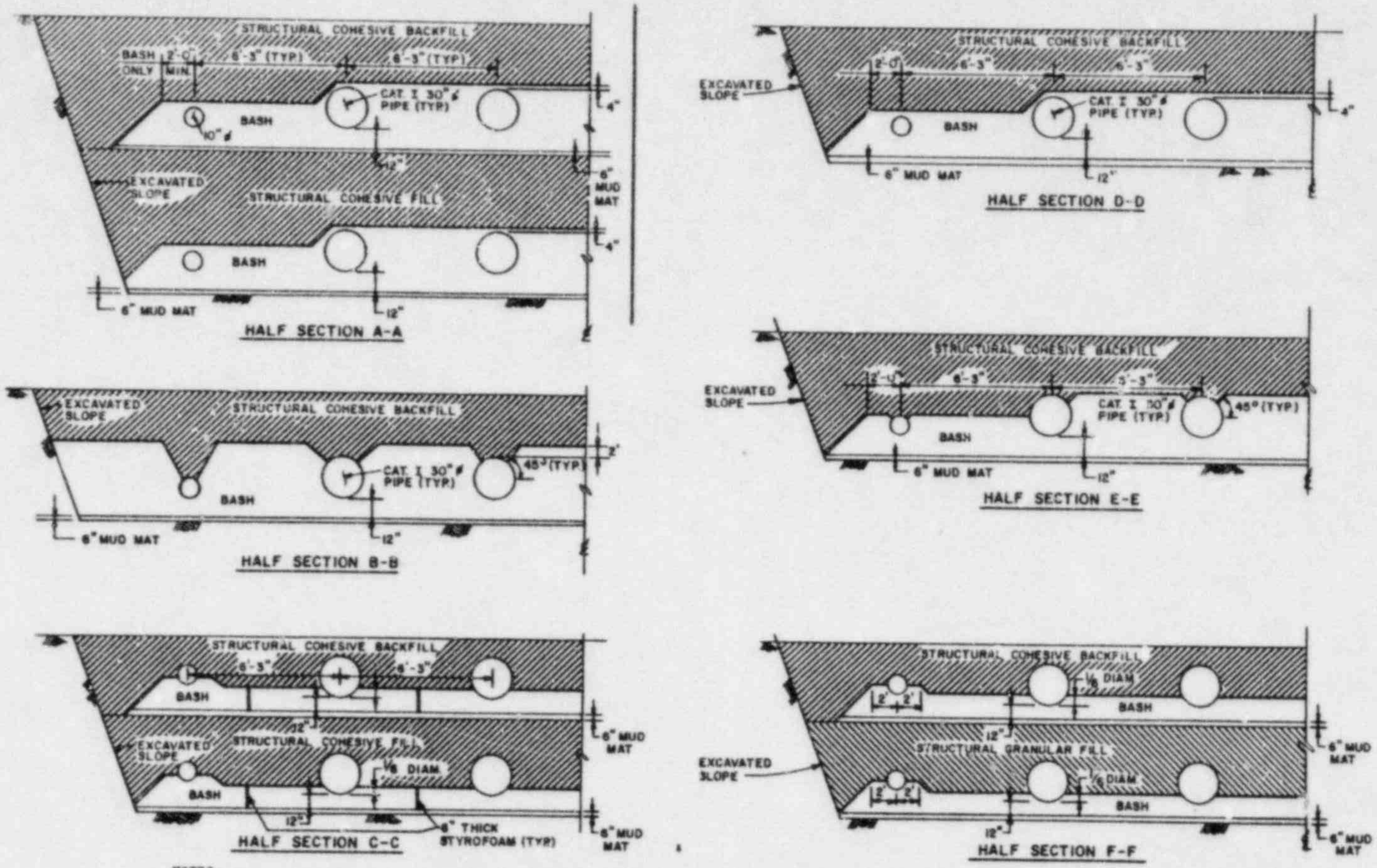


SEE NOTES ON FIGURE 2.5-486
FOR REFERENCE FIGURES.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-487

GEOLOGIC PROFILE ALONG SSWS
PIPELINE - OUTLET STRUCTURE
TO MAIN PLANT



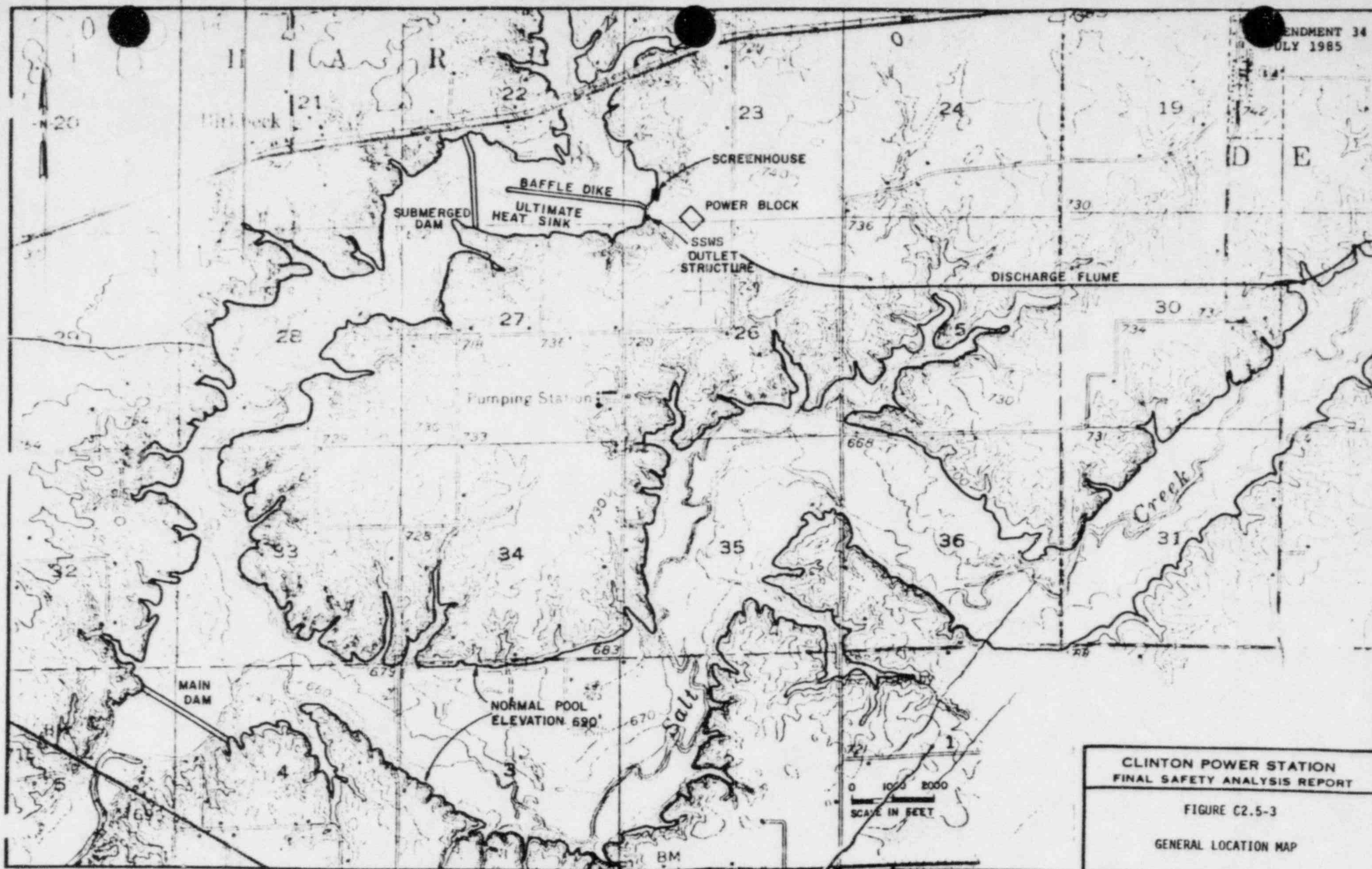
NOTES:

1. SECTIONS GIVEN ARE HALF SECTIONS AND ARE SYMMETRICAL ABOUT THE CENTERLINE.
2. SECTION C-C IS TYPICAL FOR ALL BEND LOCATIONS ALONG PIPELINE.
3. SECTION F-F IS FOR AREA IMMEDIATELY ADJACENT TO MAIN PLANT STRUCTURE ONLY.
4. LOCATION OF SECTIONS SHOWN ON FIGURES 2.5-486 AND 2.5-487.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.5-488

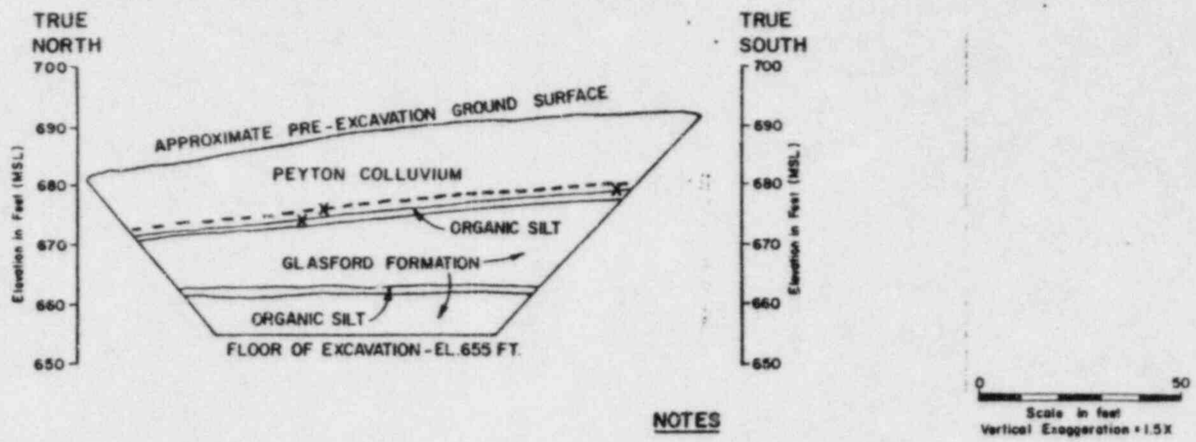
TYPICAL CROSS SECTIONS
SSWS PIPELINE



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE C2.5-3

GENERAL LOCATION MAP



NOTES

1. Location of this geologic section is shown in Figure C2.5-6, see also Figure No. C2.5-3.
2. Description and ages of stratigraphic units are presented in Figure C2.5-1.
3. Limits of excavation and slopes shown in this geologic section are approximations.
4. View is to true east.

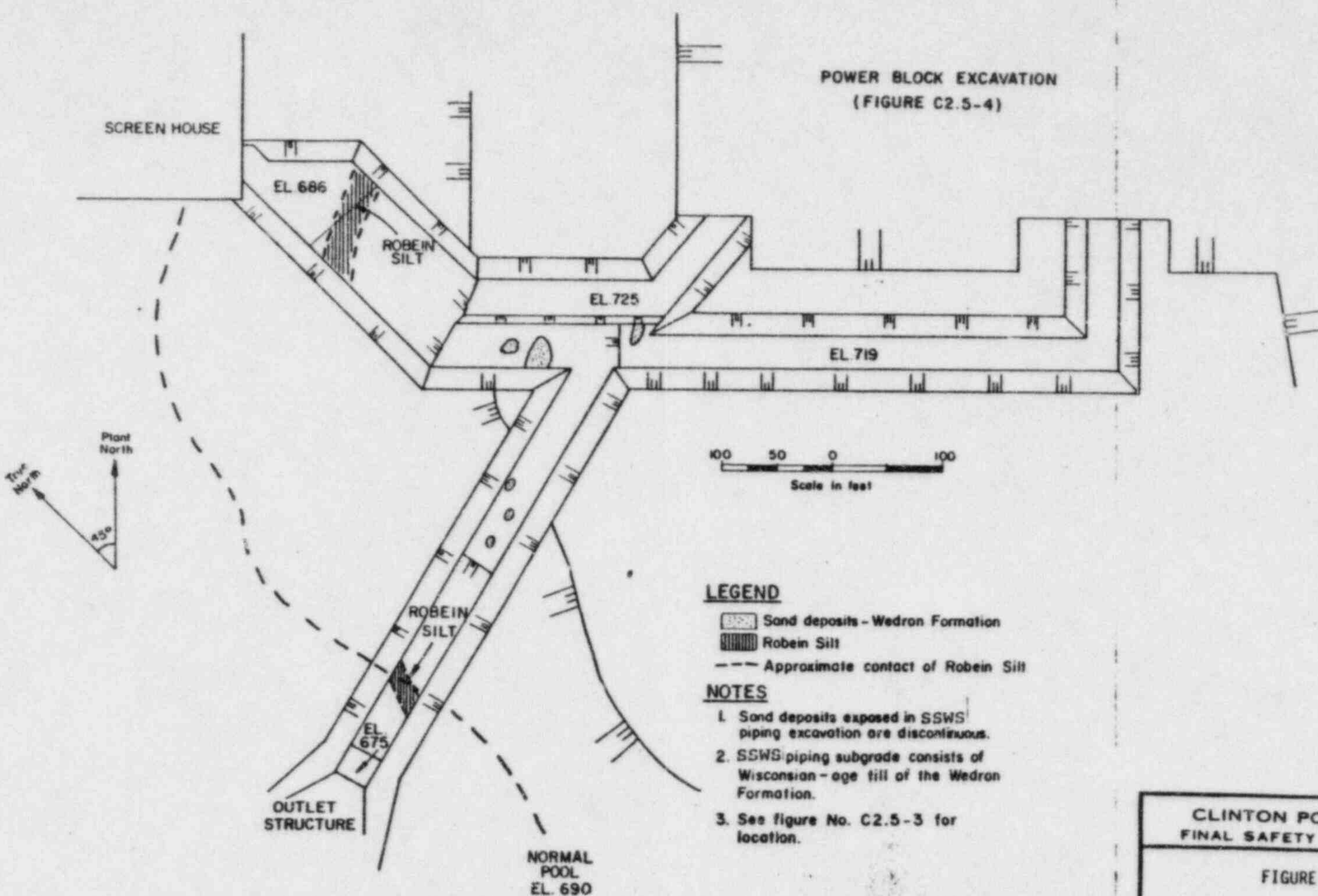
LEGEND

- – – – Inferred contact between stratigraphic units
- ——— Contact between silt units
- x Survey point

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE C2.5-22

GEOLOGIC SECTION OF THE SSWS OUTLET STRUCTURE EXCAVATION



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE C2.5-23

EXCAVATION PLAN FOR THE SSWS BUILDING

TABLE 3.2-1 (Cont'd)

PRINCIPAL COMPONENTS(a)	SAFETY CLASS(b)	SEISMIC CATEGORY(c)	QUALITY GROUP CLASSI-FICATION(d)	QUALITY ASSURANCE REQUIRE-MENTS(e)	COMMENTS	LOCATION(s)	ELECTRICAL CLASSIFICATION(t)
XXV. Shutdown Service Water Systems for Shutdown Equipment Cooling (Section 9.2.1.2) (v)							
1. Piping	3	I	C	B		A,X/F,O	N/A
2. Pumps	3	I	C	B		P	N/A
3. Pump motors	*	I	N/A	B		P	1E
4. Piping and valves forming part of the containment boundary	2	I	B	B		C,A	1E
5. Valves, other	3	I	C	B		A,X/F,O	1E
6. Electrical modules with safety function	*	I	N/A	B	(w)	N/A	1E
7. Cables with safety-related function	*	I	N/A	B		N/A	1E
XXVI. Plant Service Water Systems for Other Purposes							
1. Piping and valves, other	Other	N/A	D	N/A		A,C,T	non-1E
2. Pumps	Other	N/A	D	N/A		P	N/A
3. Motors	Other	N/A	N/A	N/A		P	non-1E
XXVII. Instrument, Breathing, and Service Air Systems							
1. Vessels, accumulators supporting safety-related systems	3	I	C	B		D,C	N/A
2. Piping and valves in lines between accumulators and safety-related systems	3	I	C	B		A,T,C	1E
3. Piping and valves forming part of containment boundary	2	I	B	B		A,C	1E
4. Control Room Emergency Breathing Air	Other	I	C	B	(bb)	X	1E
5. Remaining air systems, non-safety-related	Other	N/A	D	N/A		A,C,D,F,M,S,T,W,X	non-1E

TABLE 3.5-6

CONCRETE BARRIER PARAMETERS

Structures	Minimum Concrete Thickness	Design Strength at 91 Days (ksi)
Auxiliary Building Walls	2'-0"	3.5
Auxiliary Building Roof	1'-6"	3.5
Fuel Building Walls	2'-0"	3.5
Fuel Building Roof	2'-0"	3.5
Control Building Walls	2'-0"	3.5
Control Building Roof	2'-0"	3.5
Diesel Generator Building Walls	2'-0"	3.5
Diesel Generator Building Roof	2'-0"	3.5
Containment Wall	3'-0"	4.0
Containment Dome	2'-6"	4.0
Circulating Water Screen House Walls	2'-0"	3.5
Circulating Water Screen House Roof	1'-6"	3.5

e. Postulated design-basis breaks resulting in jet impingement loads are asumed to occur in high-energy lines at full (100%) power operation of the plant.

f. Postulated through-wall leakage cracks are postulated in moderate-energy lines and are assumed to result in wetting and spraying of safety-related structures, systems and components.

g. Reflected jets are considered only when there is an obvious reflecting surface (such as a flat plate) which directs the jet onto a safety-related target. Only the first reflection is considered in evaluating potential targets.

h. Potential targets in the jet path are considered for the full extent of pipe displacement up to the calculated final position of the broken end of the ruptured pipe. This selection of potential targets is considered adequate due to the large number of breaks analyzed and the protection provided from the effects of these postulated breaks.

Jet impingement load calculations prepared after April 1, 1984 are based on a multidimensional computer study, which also accounts for the shock effects at the jet/target interface (Reference 8). These forces are calculated using NUREG/CR-2913 (Reference 8) for the range of parameters where Reference 8 is applicable. This range includes pressures between 60 and 170 BARS (1 BAR = 14.7 psi), for steam, saturated water, and subcooled water with no more than 70° C of subcooling. For fluid parameters outside this range, the procedure in Reference 8 is extrapolated when it is determined to be appropriate, or the procedure used before April 1, 1984 is applied. When using the procedure in Reference 8, the impingement force includes the shape factor, $K\Phi$, as defined in Reference 2.

Jet impingement load calculation for the range of parameters where Reference 8 is not applicable, or calculations that were prepared before April 1, 1984, are based on the following simplified, one-dimensional procedure.

The analytical methods used to determine which targets are impinged upon by a fluid jet and the corresponding jet impingement load include:

a. The impinging jet proceeds along a straight path.

b. The total impingement force acting on any cross-sectional area of the jet is time and distance invariant, with a total magnitude equivalent to the fluid blowdown force as defined below.

c. The jet impingement force is uniformly distributed across the cross-sectional area of the jet, and only the portion intercepted by the target is considered.

d. The circumferential and longitudinal break opening is assumed to be a circular orifice of cross-sectional flow area equal to the effective flow area of the break.

e. The jet impingement force is equal to the steady state value of the fluid blowdown force as calculated by the methods described in Subsection 3.6.2.2.1.1.

f. The distance of jet travel is divided into two or three regions. Region 1 (see Figure 3.6-8) extends from the break to the asymptotic area. Within this region the discharging fluid flashes and undergoes

3.6.3 References

1. R. T. Lahey, Jr. and F. J. Moody, "Pipe Thrust and Jet Loads," The Thermal-Hydraulics of a Boiling Water Nuclear Reactor, Section 9.2.3, pp. 375-409, Published by American Nuclear Society, Prepared for the Division of Technical Information, United States Energy Research and Development Administration, 1977.

2. ANSI N176 Design Basis for Protection of Nuclear Power Plants Against Effects of Postulated Pipe Rupture, Draft, January 1975.

3. GE Spec. No. 22A2625 - "System Criteria and Applications for Protection Against the Dynamic Effects of Pipe Breaks."

4. RELAP3 - A computer Program for Reactor Blowdown Analysis IN-1321, issued June 1979, Reactor Technology TID-4500.

5. GE Report NEDE-10313 - "PDA - Pipe Dynamic Analysis Program for Pipe Rupture Movement" (Proprietary Filing)

6. Nuclear Services Corporation Report No. GEN-02-02, "Final Report Pipe-Rupture Analysis of Recirculation System for 1969 Standard Plant Design."

7. GE Safety Evaluation Report for the Design of GESSAR-238, NSSS (Docket No. STN50-550), page 3-4.

8. NUREG/CR-2913, SAND 82-1935, R4, "Two-Phase Jet Loads."

9. Sargent & Lundy Engineering Mechanics Division Technical Procedure No. 24, "Analysis of Postulated Pipe Rupture," Rev. 04, November 1979.

10. RELAP4/MOD5, Computer Program User's Manual, 09.8.026-5.5.

11. PWRRA User's Manual, 09.5.125-2.1.

ATTACHMENT B3.6

DYNAMIC EFFECTS OF POSTULATED PIPE RUPTURES

Attachment B3.6 presents specific details required in Subsection 3.6.2.5 related to the dynamic effects of each postulated pipe rupture.

The data are presented in the following format:

1. Location of postulated breaks, associated restraints, and orientations are shown in Figures B3.6-1 through B3.6-28.

2. Definitions of breaks, break type, functional restraint, and pipe stress at break locations for comparison to stress criteria are defined in Subsection 3.6.2.1, Tables B3.6-1 through B3.6-18A.

3. Typical results of pipe whip restraint analyses inside containment for high pressure core spray system are identified in Table B3.6-19.

4. Typical results to demonstrate design adequacy of those portions of high-energy piping penetrating containment for which additional stress criteria apply (i.e., within guard pipes) and for which valve operability requirement must be met (i.e., main steam isolation valves) are shown in Table B3.6-20.

TABLE B3.6-1 (Cont'd)

BREAK		RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi)			CUMULATIVE USAGE FACTOR
NUMBER	TYPE*			EQ.10	EQ.12	EQ.13	
FW-C21A	C	FW-R17	42480	58165	8160	43491	.086
FW-C21A	C	CONT. ANCH.	42480	58165	8160	43491	.086

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-1 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	2.4S_m (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
FW-C31	C	FW-R24	42480	60229	16223	40961	.226
FW-C31	C	RPV	42480	60229	16223	40961	.226
FW-C32	C	FW-R17	42480	47075	28735	23042	.211
FW-C32	C	FW-R26	42480	47075	28735	23042	.211
FW-C32	L	FW-R25A	42480	47075	28735	23042	.211
FW-C33	C	FW-R17	42480	60181	47159	14654	.312
FW-C33	C	FW-R26	42480	60181	47159	14654	.312
FW-C33	L	FW-R25A	42480	60181	47159	14654	.312
FW-C33	L	FW-R26	42480	60181	47159	14654	.312

* Break type: C = circumferential, L = longitudinal

AMENDMENT 34
JULY 1985

TABLE B3.6-1 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	2.4S_m (psi)	CALCULATED STRESS (psi) EQ. 10	EQ. 12	EQ. 13	CUMULATIVE USAGE FACTOR
FW-C34	C	FW-R25A	42480	69546	56638	13573	.435
FW-C34	C	FW-R27A	42480	69546	56638	13573	.435
FW-C34	L	FW-R26	42480	69546	56638	13573	.435
FW-C34	L	FW-R27	42480	69546	56638	13573	.435

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-1 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
FW-C40	C	FW-R30	42480	53350	19268	36243	.21
FW-C40	C	RPV	42480	53350	19268	36243	.21

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-2

BREAK DATA, LOOP 2 FEEDWATER

PIPING INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
FW-C1	C	FW-R2	42480	58165	8160	43491	.086
FW-C1	C	CONT. ANCH.	42480	58165	8160	43491	.086

* Break type; C = circumferential, L = longitudinal

TABLE B3.6-2 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	CALCULATED STRESS (psi) EQ.12	CALCULATED STRESS (psi) EQ.13	CUMULATIVE USAGE FACTOR
FW-C11	C	FW-R9	42480	60229	16223	40961	.226
FW-C11	C	RPV	42480	60229	16223	40961	.226

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-2 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
FW-C12	C	FW-R2	42480	47075	28735	23042	.211
FW-C12	C	FW-R11	42480	47075	28735	23042	.211
FW-C12	L	FW-R10A	42480	47075	28735	23042	.211
FW-C13	C	FW-R2	42480	60181	47159	14654	.312
FW-C13	C	FW-R11	42480	60181	47159	14654	.312
FW-C13	L	FW-R10A	42480	60181	47159	14654	.312
FW-C13	L	FW-R11	42480	60181	47159	14654	.312
FW-C14	C	FW-R10A	42480	69546	56638	13573	.435
FW-C14	C	FW-R12A	42480	69546	56638	13573	435
FW-C14	L	FW-R11	42480	69546	56638	13573	.435

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-2 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
FW-C20	C	FW-R15	42480	53350	19268	36243	.21
FW-C20	C	RPV	42480	53350	19268	36243	.21

* Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-3

BREAK DATA, FEEDWATER SYSTEM

PIPING OUTSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$0.8(1.2S_h + S_A)$	STRESS (psi) (EQ.9(B) & EQ.10)
3	C	CONT. ANCH.	32,400	8360
4	L	C	32,400	8360
4	L	B	32,400	8360
4	L	A	32,400	8360
4	L	E	32,400	8360
5	C	C	32,400	8130
5	C	B	32,400	8130
5	C	A	32,400	8130
6	C	C	32,400	7117
6	C	B	32,400	7117
6	C	A	32,400	7117
7	L	C	32,400	7117
7	L	B	32,400	7117
7	L	A	32,400	7117
8	C	E	32,400	6999
9	C	E	32,400	7863
A3	C	CONT. ANCH.	32,400	8612
A4	L	H	32,400	8612
A4	L	G	32,400	8612
A4	L	F	32,400	8612
A4	L	J	32,400	8612
A5	C	H	32,400	8143
A5	C	G	32,400	8143
A5	C	F	32,400	8143

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-3 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$0.8(1.2S_h + S_A)$	STRESS (psi) (EQ.9(B) & EQ.10)
A6	C	H	32,400	7511
A6	C	G	32,400	7511
A6	C	F	32,400	7511
A7	L	H	32,400	7511
A7	L	G	32,400	7511
A7	L	F	32,400	7511
A8	C	J	32,400	7141
A9	C	J	32,400	7513

* Break type: C = circumferential, L = longitudinal

TABLE B3.6-4

BREAK DATA, HPCS PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	CALCULATED STRESS (psi) EQ.12	CALCULATED STRESS (psi) EQ.13	CUMULATIVE USAGE FACTOR
HP-C6	C	HP-R3	42480	46514	8285	32280	.013
HP-C6	C	HP-R4	42480	46514	8285	32280	.013

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-4 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	2.4Sm (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
HP-C6	C	RPV	42480	46514	8285	32280	.013
HP-C8	C	HP-R4A	42480	56874	18825	37592	.009
HP-C8	C	HP-R3	42480	56874	18825	37592	.009
HP-C8	C	RPV	42480	56874	18825	37592	.009
HP-C9	C	HP-R5	42480	42927	155	31919	.027
HP-C9	C	RPV	42480	42927	155	31919	.027

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-5

BREAK DATA, LPCS PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	2.4Sm (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
LP-C1A	C	LP-R1	42480	47658	7468	34976	.031
LP-C1A	C	LP-R2A	42480	47658	7468	34976	.031

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-5 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
LP-C8	C	LP-R4A	42480	56241	29187	35849	.006
LP-C8	C	LP-R3	42480	56241	29187	35849	.006
LP-C8	C	RPV	42480	56241	29187	35849	.006
LP-C9A	C	RPV	42480	50326	5127	36974	.011
LP-C9A	C	LP-R5	42480	50326	5127	36974	.011

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-6

BREAK DATA, LOOP 1 MAIN STEAM

PIPING INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C57	C	MS-R24, MS-R25, MS-R26. MS-R27	42480	49368	25416	19583	.0068
MS-C57	C	CONT. ANCH.	42480	49368	25416	19583	.0068
MS-C58	C	MS-R23	42480	49368	25416	19583	.0068
MS-C58	C	MS-R27, MS-R26	42480	49368	25416	19583	.0068

* Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-6 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C68	C	RPV	42480	59265	42233	18423	.0175
MS-C68	C	MS-R26	42480	59265	42233	18423	.0175
MS-C68	L	MS-R28, RPV	42480	67675	49264	18661	.0423
MS-C69	C	MS-R28	42480	27465	13562	15348	.0009
MS-C69	C	RPV	42480	27465	13562	15348	.0009

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-7

BREAK DATA, LOOP 2 MAIN STEAM

PIPING INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	CALCULATED STRESS (psi) EQ.12	CALCULATED STRESS (psi) EQ.13	CUMULATIVE USAGE FACTOR
MS-C21	C	MS-R10, MS-R11, MS-R12, MS-R13	42480	37886	6653	21515	.059
MS-C21	C	CONT. ANCH.	42480	37886	6653	21515	.059

* Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-7 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C33	C	RPV	42480	57236	40815	28313	.0146
MS-C33	C	MS-R12	42480	57236	40815	28313	.0146
MS-C33	L	MS-R14, RPV	42480	64551	47389	23406	.0306
MS-C34	C	MS-R14	42480	26550	13034	17022	.0008
MS-C34	C	RPV	42480	26550	13034	17022	.0008

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-8

BREAK DATA, LOOP 3 MAIN STEAM

PIPING INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	2.4Sm (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C35	C	MS-R16, MS-R18, MS-R20	42480	39029	6912	18643	.064
MS-C35	C	CONT. ANCH.	42480	39029	6912	18643	.064

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-8 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C55	C	MS-R19, Shield Wall	42480	53660	36569	19269	.0104
MS-C55	C	RPV	42480	53660	36569	19269	.0104
MS-C56	C	MS-R22	42480	25536	11785	16495	.0006
MS-C56	C	RPV	42480	25536	11785	16495	.0006

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-9

BREAK DATA, LOOP 4 MAIN STEAM

PIPING INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C1	C	MS-R2, MS-R4, MS-R6	42480	39029	6912	18643	.064
MS-C1	C	CONT. ANCH.	42480	39029	6912	18643	.064

*Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-9 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C19	C	MS-R5, Shield Wall	42480	53660	36569	19269	.0104
MS-C19	C	RPV	42480	53660	36569	19269	.0104
MS-C20	C	MS-R8	42480	25536	11785	16495	.0006
MS-C20	C	RPV	42480	25536	11785	16495	.0006

* Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-10

BREAK DATA, MAIN STEAM DRAIN

LINE INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT**	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C69	C		42480	69072	6139	42259	.248
MS-C74	C		42480	64445	8389	38309	.077
MS-C78	C		42480	62130	11305	38313	.317

* Break type: C = circumferential.

** Pipe breaks cause no impact on essential components; restraints are for protection of containment isolation valves. (See Figure B3.6-10 for break and restraint locations.)

TABLE B3.6-10 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT**	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
MS-C87	C		42480	60779	19271	38542	.335
MS-C93	C		42480	39658	—	—	.130
MS-C94	C		42480	61721	24334	38615	.409

* Break type: C = circumferential.

** Pipe breaks cause no impact on essential components; restraints are for protection of containment isolation valves. (See Figure B3.6-10 for break and restraint locations.)

TABLE B3.6-11

BREAK DATA, MAIN STEAM DRAIN

LINE OUTSIDE CONTAINMENT

BREAK** NUMBER	BREAK** TYPE*	RESTRAINT	$0.8(1.2S_h + S_A)$	CALCULATED STRESS
1	C	290	Not Applicable	Not Applicable
1	C	520	Not Applicable	Not Applicable
2	C	225	Not Applicable	Not Applicable
2	C	240B	Not Applicable	Not Applicable
2	C	290	Not Applicable	Not Applicable

* Break type: C = circumferential.

** Breaks were not postulated by stress level, but selected for the worst loading cases on the containment isolation valve.

TABLE B3.6-12

BREAK DATA, MAIN STEAM PIPING

OUTSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$0.8(1.2S_h + S_A)$	STRESS (psi) (EQ.9(B) & EQ.10)
3L	L	N	32,400	20788
3L	L	T	32,400	20788
3L	L	M	32,400	20788
3L	L	P	32,400	20788
4C	C	N	32,400	20788
4C	C	T	32,400	20788
4C	C	M	32,400	20788
5L	L	N	32,400	20760
5L	L	T	32,400	20760
5L	L	M	32,400	20760
6C	C	N	32,400	20760
6C	C	T	32,400	20760
6C	C	M	32,400	20760
6C	C	P	32,400	20760
9L	L	J	32,400	17138
9L	L	S	32,400	17138
9L	L	I	32,400	17138
9L	L	L	32,400	17138
10C	C	J	32,400	17138
10C	C	S	32,400	17138
10C	C	I	32,400	17138
11L	L	J	32,400	17049
11L	L	S	32,400	17049
11L	L	I	32,400	17049
12C	C	J	32,400	17049
12C	C	S	32,400	17049
12C	C	I	32,400	17049
12C	C	L	32,400	17049

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-12 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$0.8(1.2S_h + S_A)$	STRESS (psi) (EQ.9(B) & EQ.10)
A3L	L	F	32,400	18441
A3L	L	R	32,400	18441
A3L	L	E	32,400	18441
A3L	L	H	32,400	18441
A4C	C	F	32,400	18441
A4C	C	R	32,400	18441
A4C	C	E	32,400	18441
A5L	L	F	32,400	18429
A5L	L	R	32,400	18429
A5L	L	E	32,400	18429
A6C	C	F	32,400	18429
A6C	C	R	32,400	18429
A6C	C	E	32,400	18429
A6C	C	H	32,400	18429
A9L	L	B	32,400	17414
A9L	L	Q	32,400	17414
A9L	L	A	32,400	17414
A9L	L	D	32,400	17414
A10C	C	B	32,400	17414
A10C	C	Q	32,400	17414
A10C	C	A	32,400	17414
A11L	L	B	32,400	16995
A11L	L	Q	32,400	16995
A11L	L	A	32,400	16995
A12C	C	B	32,400	16995
A12C	C	Q	32,400	16995
A12C	C	A	32,400	16995
A12C	C	D	32,400	16995

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-13

BREAK DATA, LOOP 1 RHR PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RH-C1	C	RH-R2	42480	43906	1594	34807	.004

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-13 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RH-C8	C	RH-R3	42480	43192	20255	23705	.008
RH-C8	C	RPV	42480	43192	20255	23705	.008
RH-C9	C	RH-R5	42480	59810	37624	36077	.037
RH-C10	C	RH-R5	42480	54368	11160	38757	.051

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-14

BREAK DATA, LOOP 2 RHR PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	CALCULATED STRESS (psi) EQ.12	CALCULATED STRESS (psi) EQ.13	CUMULATIVE USAGE FACTOR
RH-C20	C	RH-R10	44280	55991	12968	36823	.012
RH-R21	C	RH-R9	44280	55987	14303	36554	.012
RH-R21	C	RPV	44280	55987	14303	36554	.012
RH-C25	C	RH-R11	48000	75354	37104	45409	.050
RH-C25	C	RPV	48000	75354	37104	45409	.050
RH-C26	C	RH-R11	44280	63668	15276	42726	.069

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-15

BREAK DATA, LOOP 3 RHR PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RH-C15	C	RPV	42480	40211	—	—	.005
RH-C17	C	RH-R8	42480	76914	42803	39573	.075
RH-C17	C	RPV	42480	76914	42803	39573	.075
RH-C18	C	RH-R8	42480	56931	19408	40157	.047

TABLE B3.6-16

BREAK DATA, LOOP 4 RHR PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RH-C32	C	20" RR LINE	42480	50302	3267	39229	.092
RH-C35	C	RH-R14	45780	66214	30127	31654	.664
RH-C35	C	RH-R14A	45780	66214	30127	31654	.664

* Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-17

BREAK DATA, RCIC PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RI-C5	C	RI-R1	42240	65005	13171	41286	.072
RI-C5	C	RI-R2	42240	65005	13171	41286	.072
RI-C5	C	RI-R5	42240	65005	13171	41286	.072
RI-C6	C	RI-R4	42240	55994	10208	37208	.032
RI-C6	C	RI-R8	42240	55994	10208	37208	.032
RI-C5A	C	RI-R1	42240	55621	22692	34697	.019
RI-C5A	C	RI-R2	42240	55621	22692	34697	.019
RI-C5A	C	RI-R5	42240	55621	22692	34697	.019

* Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-17 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RI-C11	C	RI-R7	42240	67620	10089	48211	.181
RI-C11	C	RI-R8	42240	67620	10089	48211	.181
RI-C11	C	RI-R9	42240	67620	10089	48211	.181
RI-C11	C	RI-R10	42240	67620	10089	48211	.131

TABLE B3.6-18

BREAK DATA, RWCU PIPING

INSIDE CONTAINMENT

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10 (Terminal End Break)	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RT-C1	C	CONT. PENE.	42480				
RT-C1	C	RT-R2	42480				
RT-C5	C	RT-R1	41520				
RT-C5	C	RT-R5	41520				
RT-C5	L	RT-R4	41520				
RT-C6	C	RT-R4	41520				
RT-C6	C	RT-R7	41520				
RT-C6	L	RT-R5	41520				
RT-C7	C	RT-R4	41520				
RT-C7	C	RT-R7	41520				
RT-C7	L	RT-R6	41520				
RT-C8	C	RT-R6	41520				
RT-C8	C	RT-R9	41520				
RT-C8	L	RT-R7	41520				

* Break type: C = circumferential, L = longitudinal.

TABLE B3.6-18 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RT-C27A	C	20" RR LINE	32940	62280	10729	33733	.179
RT-C27A	C	NONE**	32940	62280	10729	33733	.179
RT-C27A	L	20" RR LINE	32940	62280	10729	33733	.179
RT-C28	C	NONE**	32940	64601	38102	29528	.133
RT-C28	C	20" RR LINE	32940	64601	38102	29528	.133
RT-C28	L	20" RR LINE	32940	64601	38102	29528	.133

* Break type: C = circumferential, L = longitudinal.

** No impact on essential components.

TABLE B3.6-18 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RT-C28B	C	NONE**	32940	40816	16881	24234	0
RT-C28C	C	NONE**	32940	60217	38092	23971	.076
RT-C28C	L	NONE**	32940	60217	38092	23971	.076

*Break type: C = circumferential, L = longitudinal.

**No impact on essential components.

TABLE B3.6-18 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	CALCULATED STRESS (psi) EQ.12	CALCULATED STRESS (psi) EQ.13	CUMULATIVE USAGE FACTOR
RT-C35A	C	NONE**	32940	33331	12939	20639	.000
RT-C35A	C	20" RR LINE	32940	33331	12939	20639	.000
RT-C35BB	C	NONE**	32940	50341	33449	23710	.005
RT-C35BB	C	NONE**	32940	50341	33449	23710	.005
RT-C39	C	NONE**	42480	65309	5291	40672	.372

* Break type: C = circumferential, L = longitudinal.

** No impact on essential components

TABLE B3.6-18 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ. 13	CUMULATIVE USAGE FACTOR
RT-C40	C	NONE**	42480	42474	-	-	.172
RT-C40A	C	NONE**	42480	42818	7	30864	.116

* Break type: C = circumferential, L = longitudinal.

** No impact on essential components.

TABLE B3.6-18 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	$2.4S_m$ (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RT-C58	C	NONE**	42480	44186	13376	30227	.133
RT-C58	L	NONE**	42480	44186	13376	30227	.133

* Break type: C = circumferential, L = longitudinal.

** No impact on essential components.

TABLE B3.6-18 (Cont'd)

BREAK NUMBER	BREAK TYPE*	RESTRAINT	2.4Sm (psi)	CALCULATED STRESS (psi) EQ.10	EQ.12	EQ.13	CUMULATIVE USAGE FACTOR
RT-C79	C	NONE**		(Terminal End Break)			

* Break type: C = circumferential, L = longitudinal.

** No impact on essential components.

TABLE B3.6-18A

BREAK DATA, RWCU PIPING OUTSIDE CONTAINMENT

BREAK NUMBER	TYPE*	RESTRAINT	ALLOWABLE (psi) $0.8\ (1.2S_h + S_A)$	CALCULATED STRESS (psi) (EQ. 9B and EQ. 10)
RT-601	C	-	32400	17003
RT-602	C	-	32400	15688
RT-603	C	-	32400	1961
RT-604	C	-	32400	2531
RT-605	C	-	32400	2851

* Break type: C = circumferential, L = longitudinal.

AMENDMENT 34
JULY 1985

TABLE B3.6-19

RESULTS OF WHIP RESTRAINT ANALYSES FOR HIGH PRESSURE CORE SPRAY INSIDE CONTAINMENT

PIPING SYSTEM							RESTRAINT INFORMATION*		
POSTULATED BREAK ID	RESTRAINT ID	F_{imp} (kips)	T_{imp} (10^{-3} sec.)	F_{FINAL} (kips)	GAP (inches)	TIP DIS-PLACEMENT (inches)	ACTUAL DEFLEC-TION (inches)	PEAK DYNAMIC LOAD (kips	ALLOWABLE DEFLECTION (inches)
HIGH-PRESSURE CORE SPRAY									
HP-C6:C	HP-R3	71.54	0.0003	0.0	10.12	19.32	3.539	268.51	5.810
HP-C6:C	HP-R4	-	-	48.42	2.01	4.44	1.176	128.3	2.00
HP-C8:C	HP-R4A	41.03	0.0023	0.0	7.53	9.947	1.403	216.0	2.00
HP-C9:C	HP-R5	-	-	100.95	7.297	18.132	4.65	281.9	6.292
HP-C8:C	HP-R3	58.59	.003	0.0	10.12	19.32	3.539	268.51	5.810

*Restraint information is based on current analysis.

TABLE B3.6-20

RESULTS OF CONTAINMENT PENETRATION PIPING ANALYSES

FOR FEEDWATER INSIDE CONTAINMENT

BREAK NUMBERS	RESTRAINT NUMBER (GUIDE)	PEAK RESTRAINT REACTION (kips)	STRESS (psi)	
			MAXIMUM PIPE STRESS IN CONTAINMENT PENETRATION AREA	ALLOWABLE
FWC22L & FWC32L	FWR16	270	23845	44381
	FWR16A	462		

TABLE B3.6-21

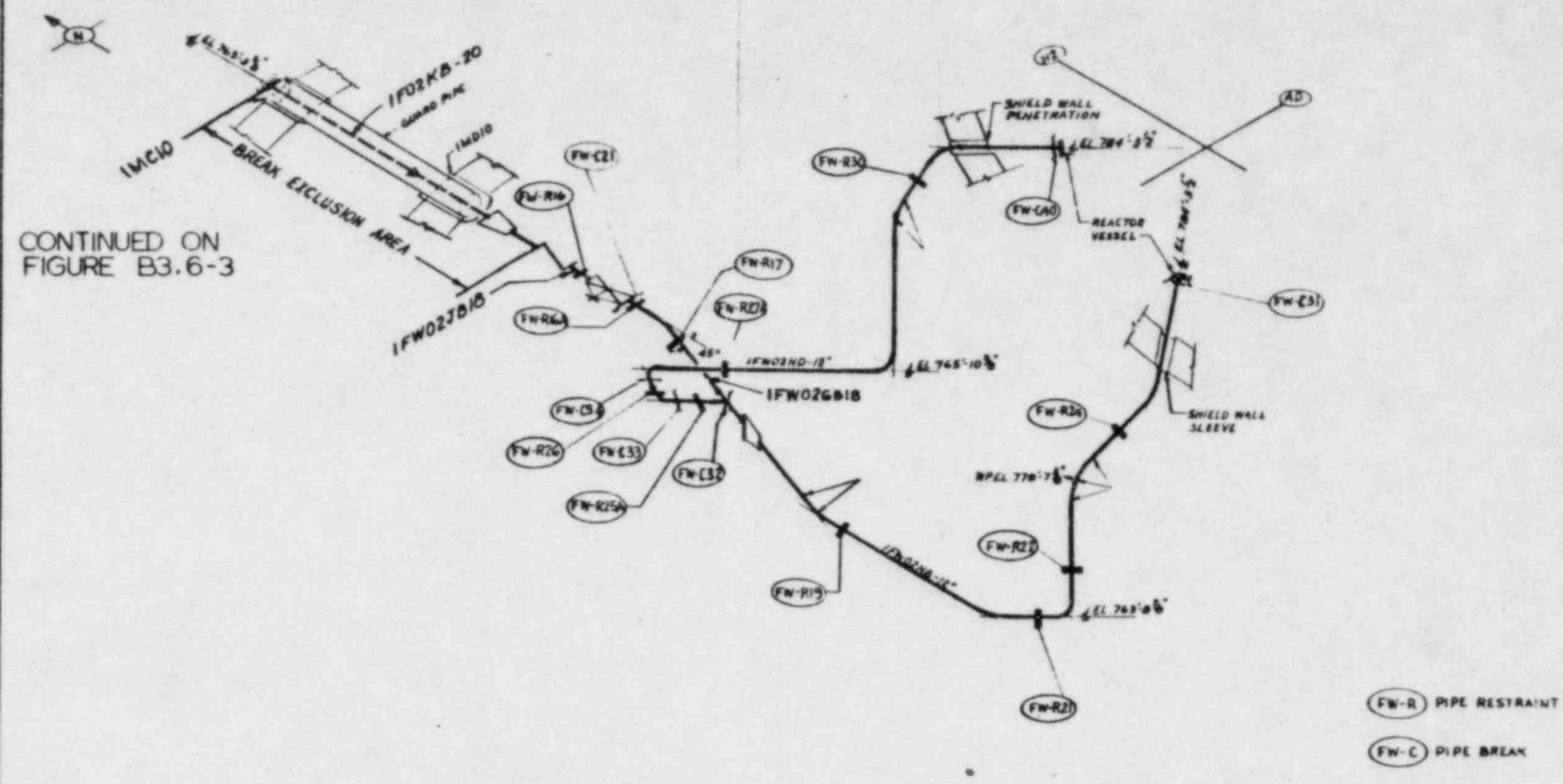
BREAK DATA, REACTOR

RECIRCULATION PIPING SYSTEM*

BREAK IDENT.	STRESS RATIO PER ASME EQNS. EQ(10) $\frac{S_n}{3S_m}$	EQ(12) $\frac{S_o}{3S_m}$	EQ(13) $\frac{S}{3S}$	USAGE FACTOR	BREAK TYPE	BREAK BASES SECTION NO.
RS1	0.72	0.23	0.65	0.0	CIRCMF	3.6.2.1.6.1.a
RS3$_{LL}^{**}$	1.31	0.80	0.53	0.27	LONG	3.6.2.1.6.1.b
RD1	0.56	0.12	0.54	0.0	CIRCMF	3.6.2.1.6.1.a
RD2	0.80	0.34	0.51	0.0	CIRCMF	3.6.2.1.6.1.a
RD3	0.73	0.22	0.54	0.0	CIRCMF	3.6.2.1.6.1.a
RD4	0.67	0.19	0.50	0.0	CIRCMF	3.6.2.1.6.1.a
RD5	0.77	0.32	0.39	0.0	CIRCMF	3.6.2.1.6.1.a
RD6	0.50	0.14	0.36	0.0	CIRCMF	3.6.2.1.6.1.c
RD7	0.47	0.11	0.36	0.0	CIRCMF	3.6.2.1.6.1.c
RD8	0.38	0.04	0.36	0.0	CIRCMF	3.6.2.1.7.1.c
RD9	0.40	0.05	0.36	0.0	CIRCMF	3.6.2.1.6.1.c

* Loop A same as Loop B except as noted.
** Loop B only. Subscript "LL" indicates longitudinal break.

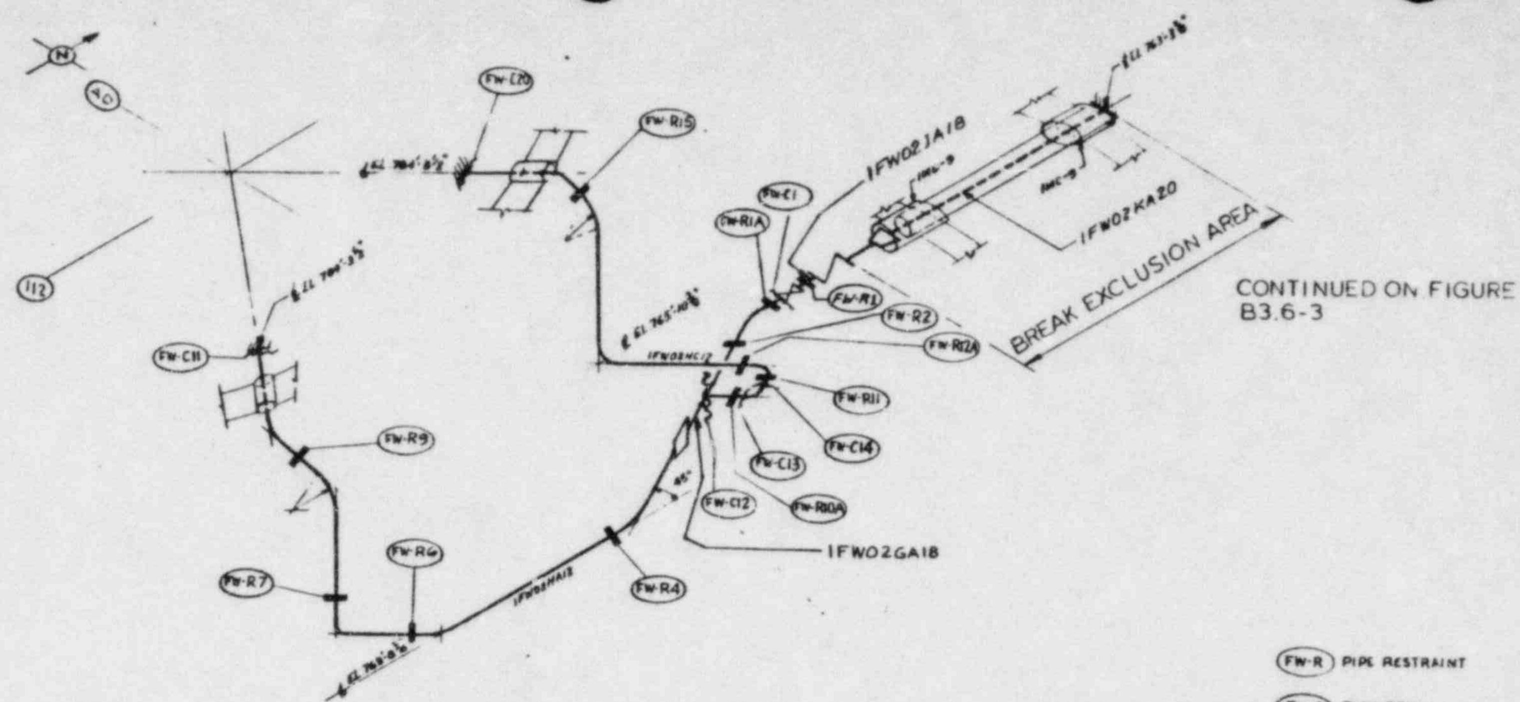
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-1

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS FEEDWATER PIPING INSIDE CONTAINMENT LOOP-1

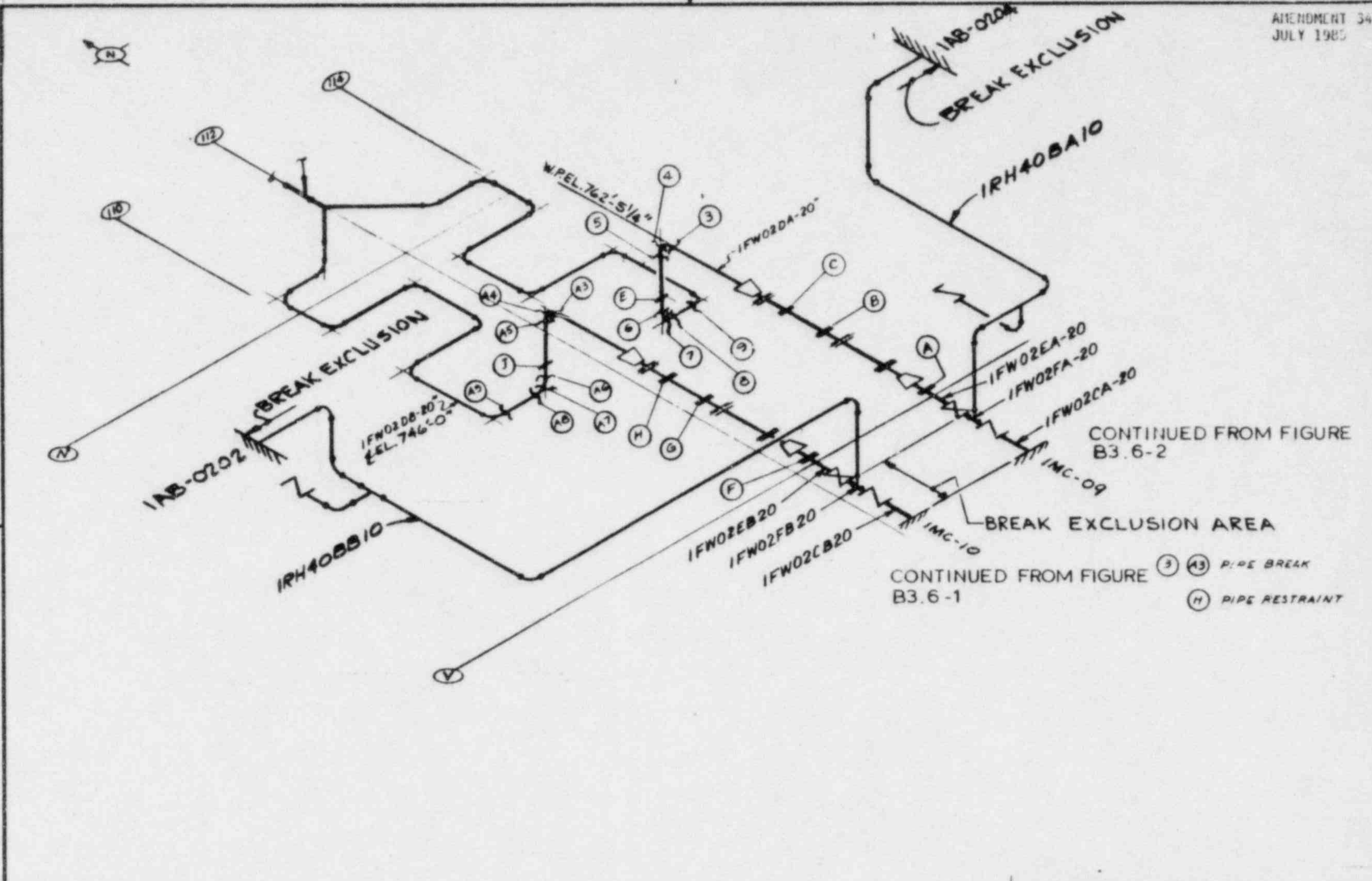


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-2

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS FEEDWATER PIPING INSIDE CONTAINMENT LOOP-2

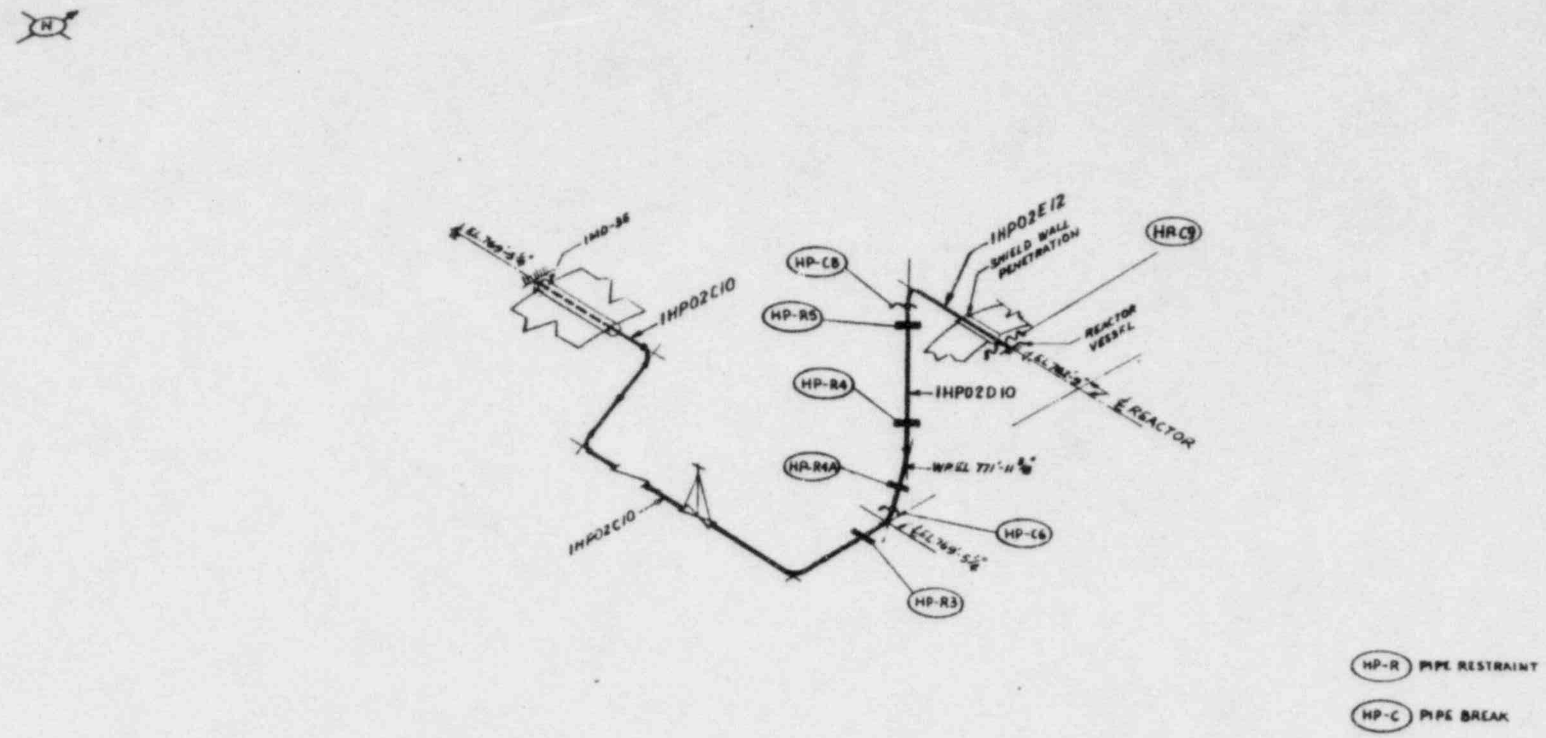
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-3

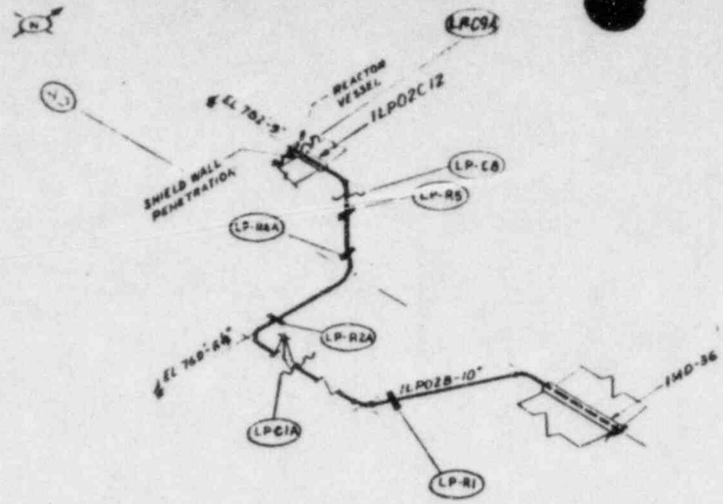
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS FEEDWATER PIPING OUTSIDE CONTAINMENT



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-4

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS HIGH PRESSURE CORE SPRAY PIPING INSIDE CONTAINMENT



(LP-R) PIPE RESTRAINT

(LP-C) PIPE BREAK

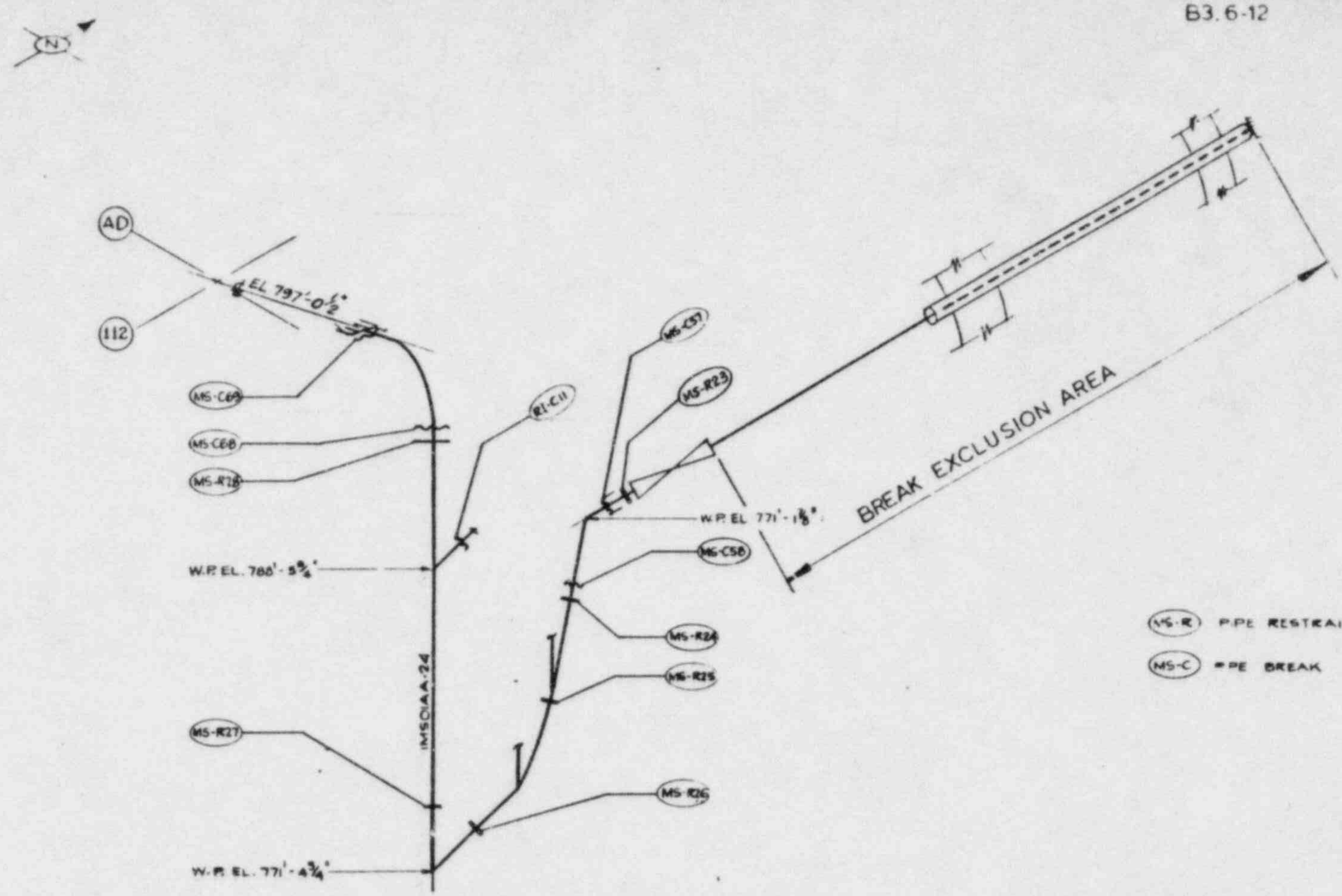
CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-5

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS LOW PRESSURE CORE SPRAY PIPING INSIDE CONTAINMENT

AMENDMENT 34
JULY 198

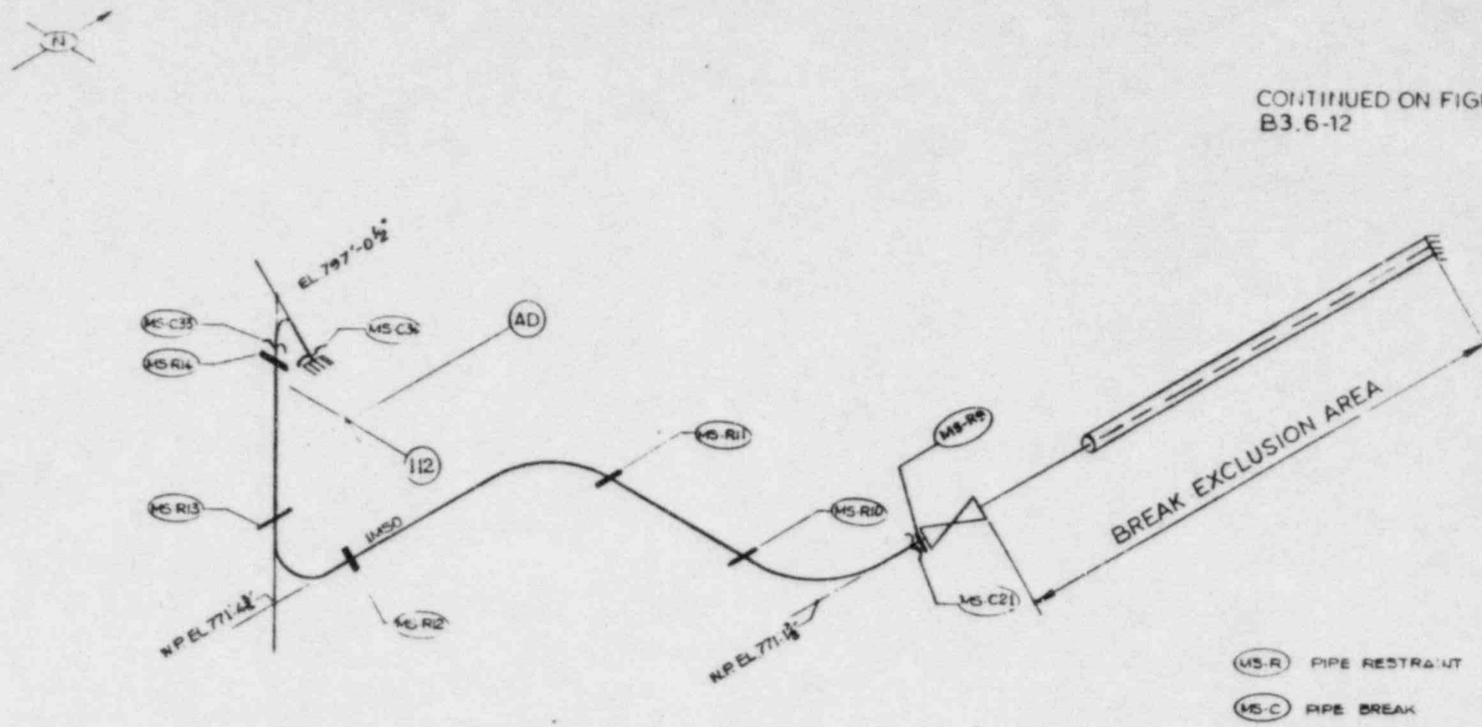
CONTINUED ON FIGURE
B3.6-12



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-6

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM PIPING INSIDE CONTAINMENT LOOP-1

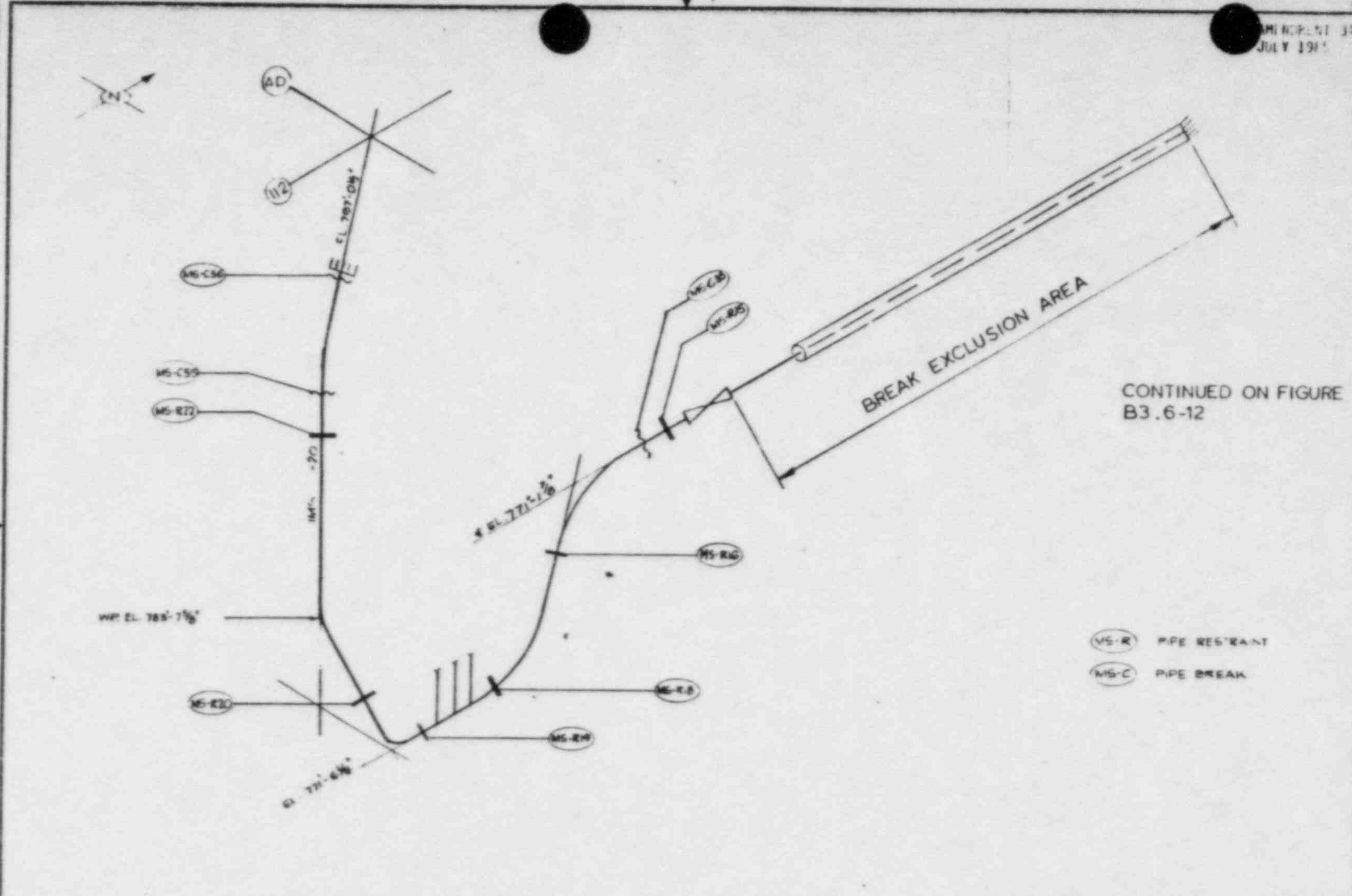


CONTINUED ON FIGURE B3.6-12

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-7

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM PIPING INSIDE CONTAINMENT LOOP-2

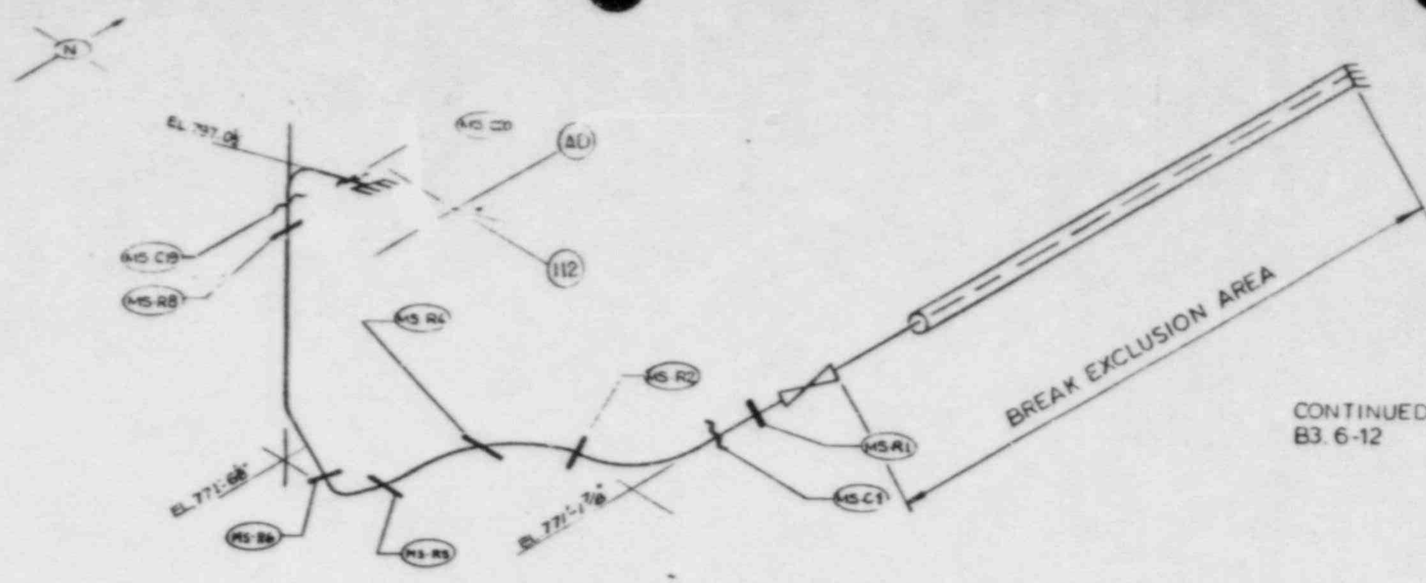


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-8

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM PIPING INSIDE CONTAINMENT LOOP-3

AMENDMENT 34
JULY 1985

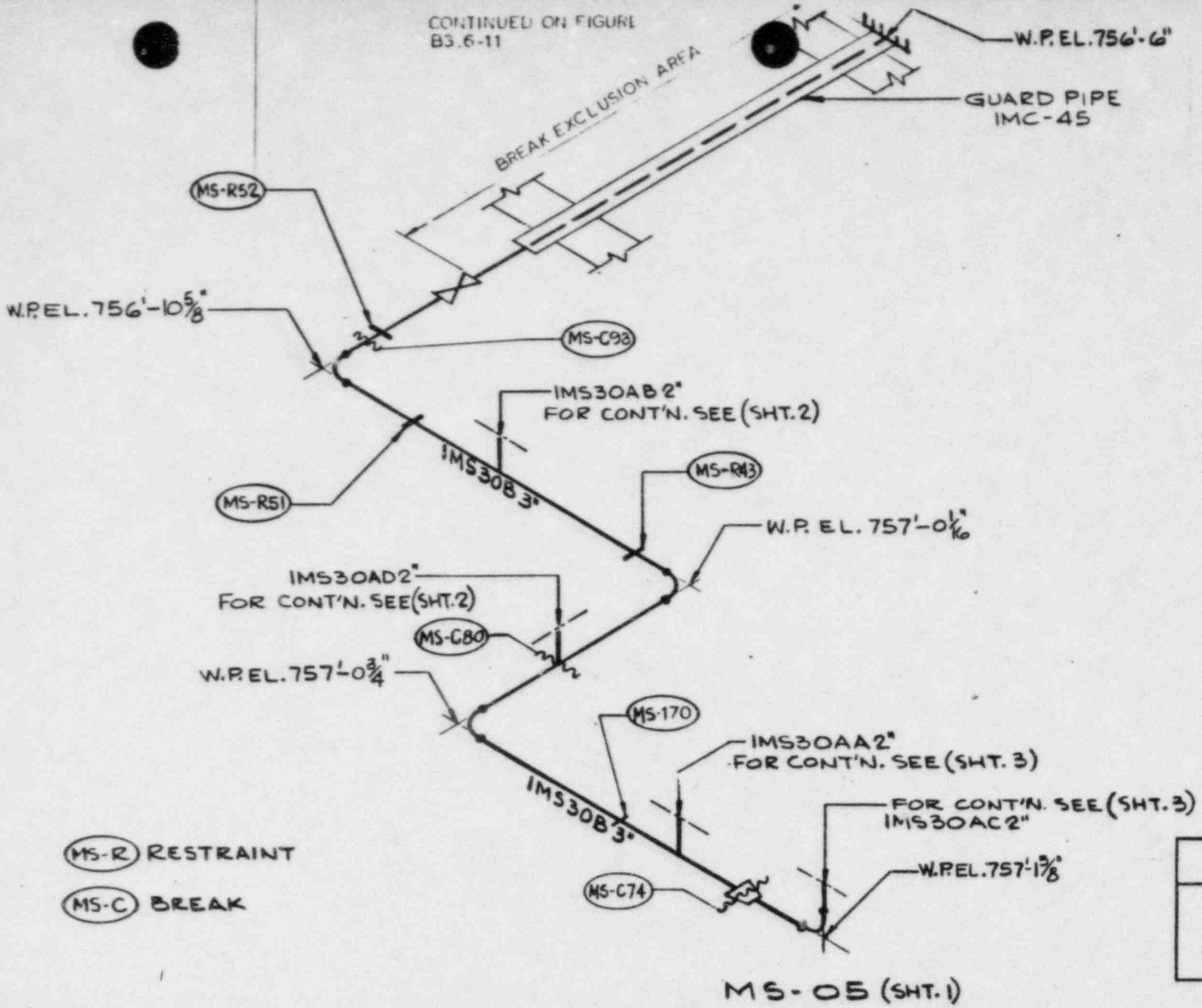


CONTINUED ON FIGURE B3.6-12

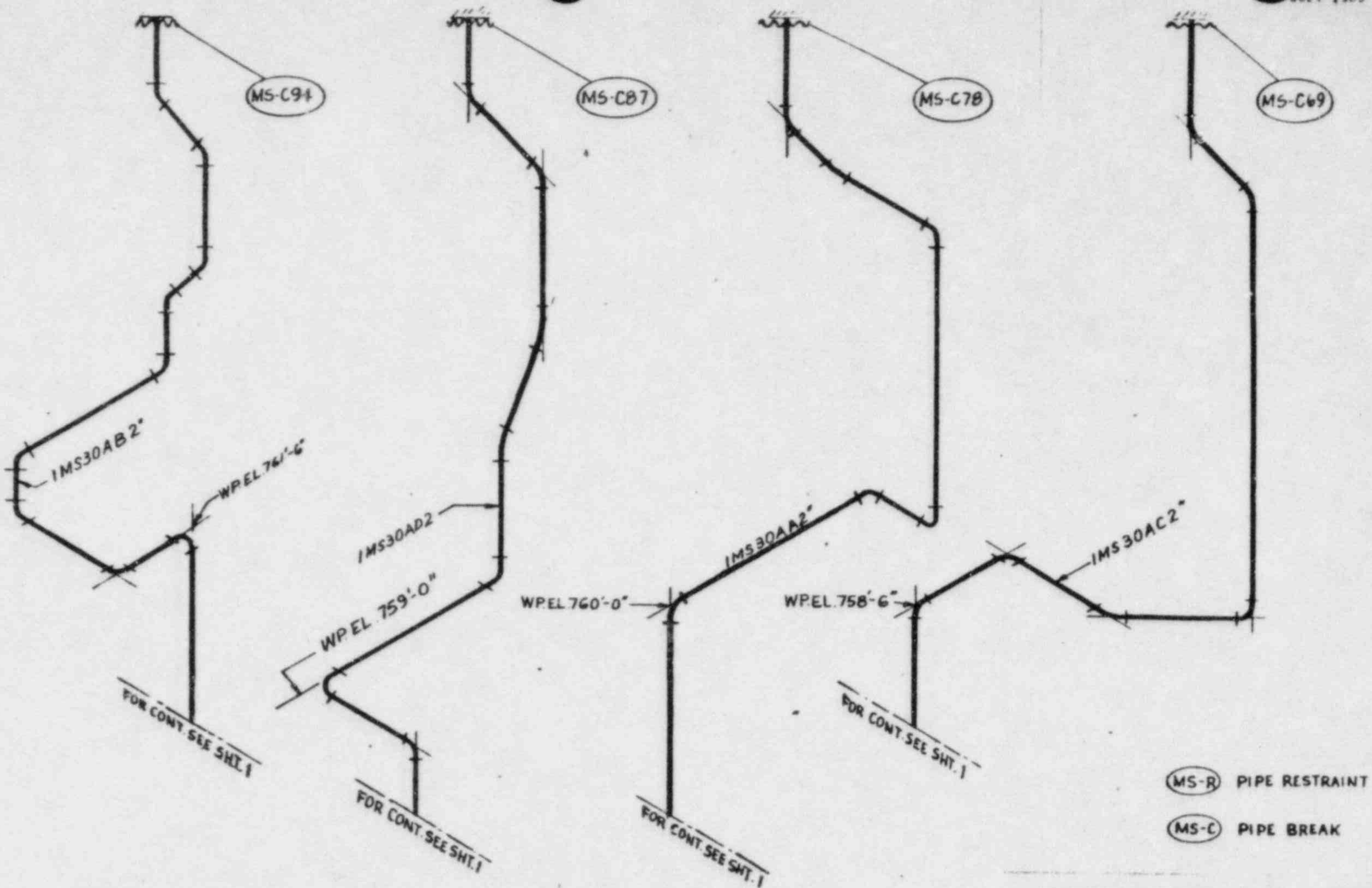
CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-9

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM PIPING INSIDE CONTAINMENT LOOP-4



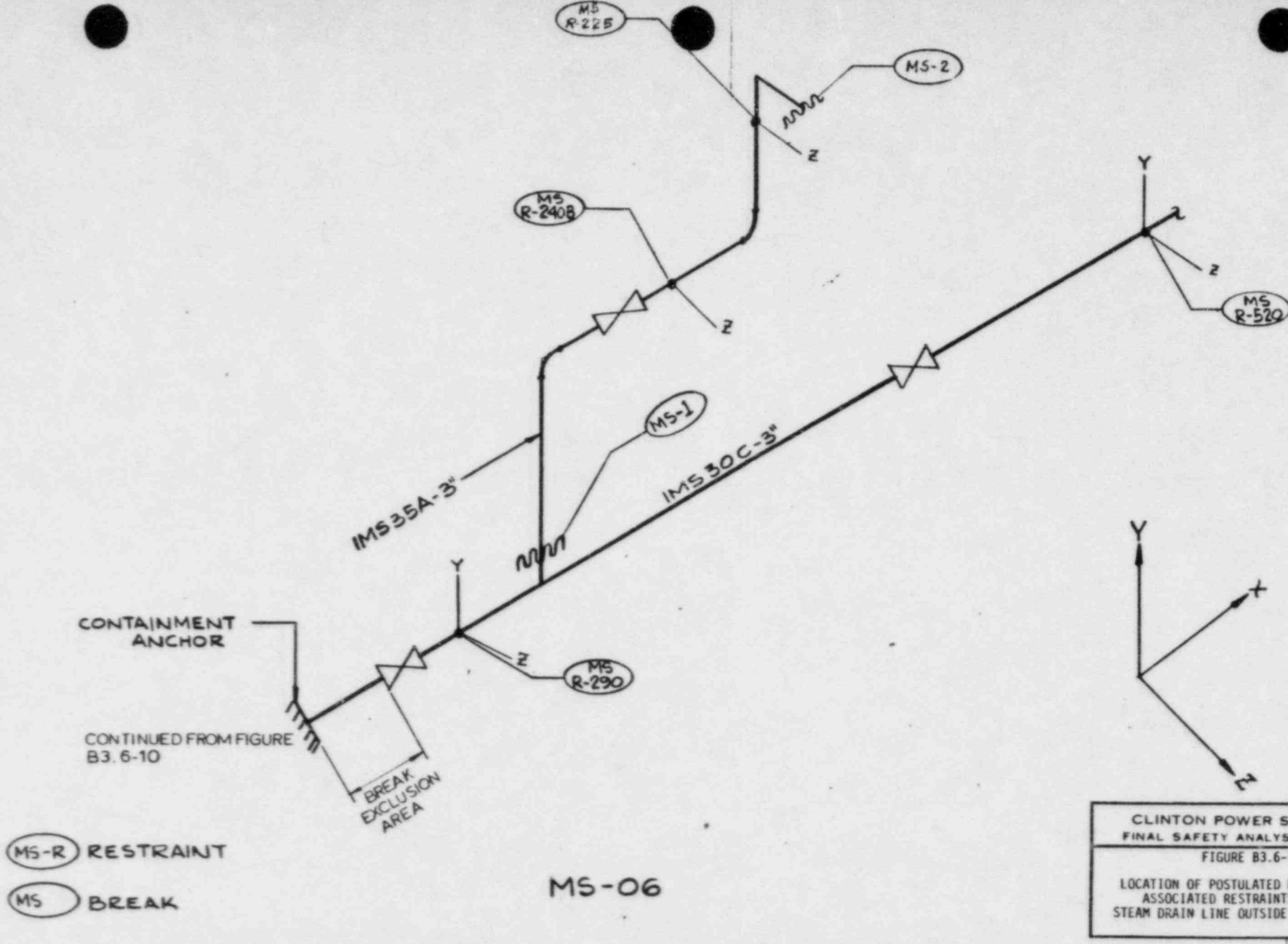
CLINTON POWER STATION FINAL SAFETY ANALYSIS REPORT
FIGURE B3.6-10 LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM DRAIN LINE INSIDE CONTAINMENT (SHEET 1 OF 2)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-10

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM DRAIN LINE INSIDE CONTAINMENT (SHEET 2 OF 2)

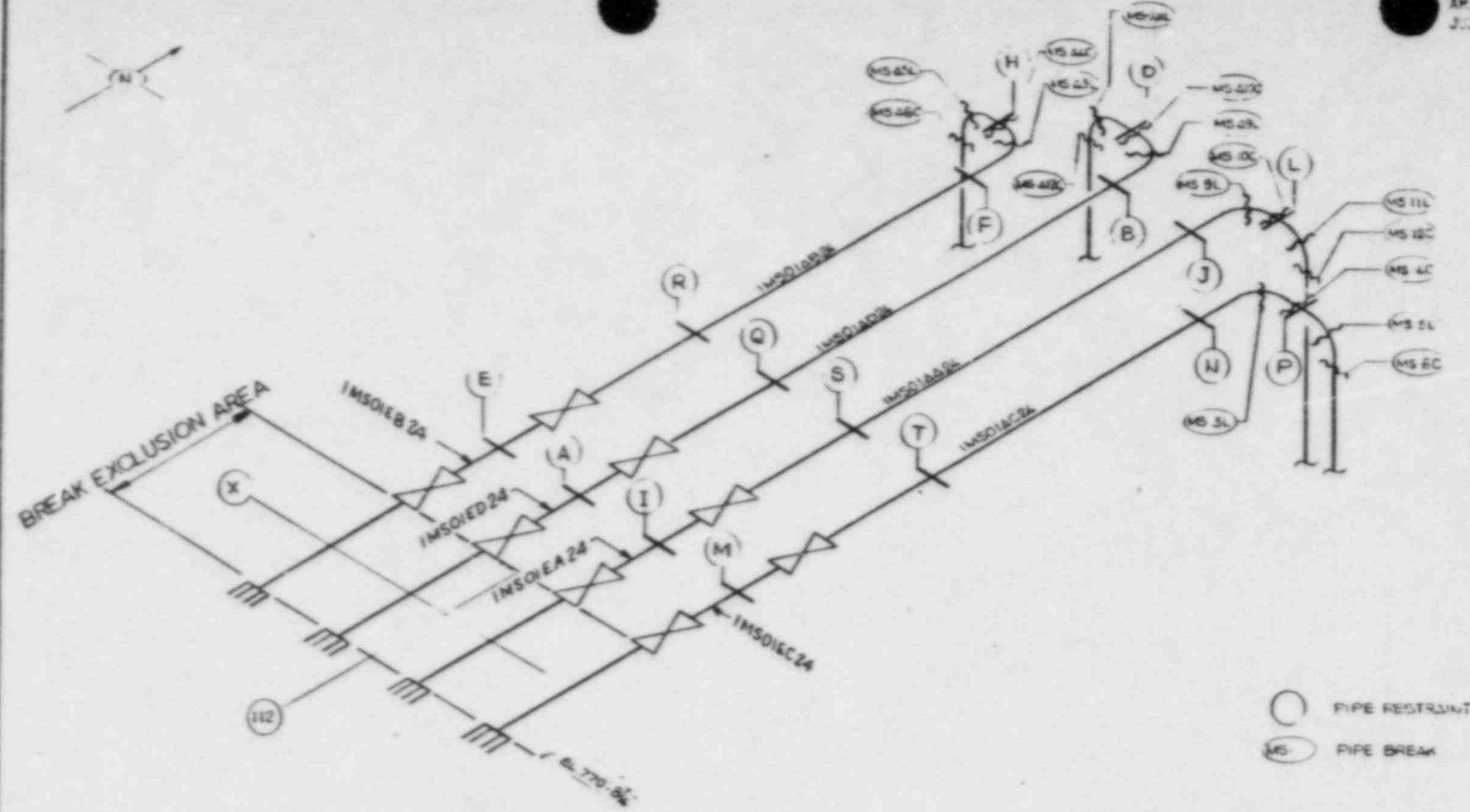


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-11

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM DRAIN LINE OUTSIDE CONTAINMENT

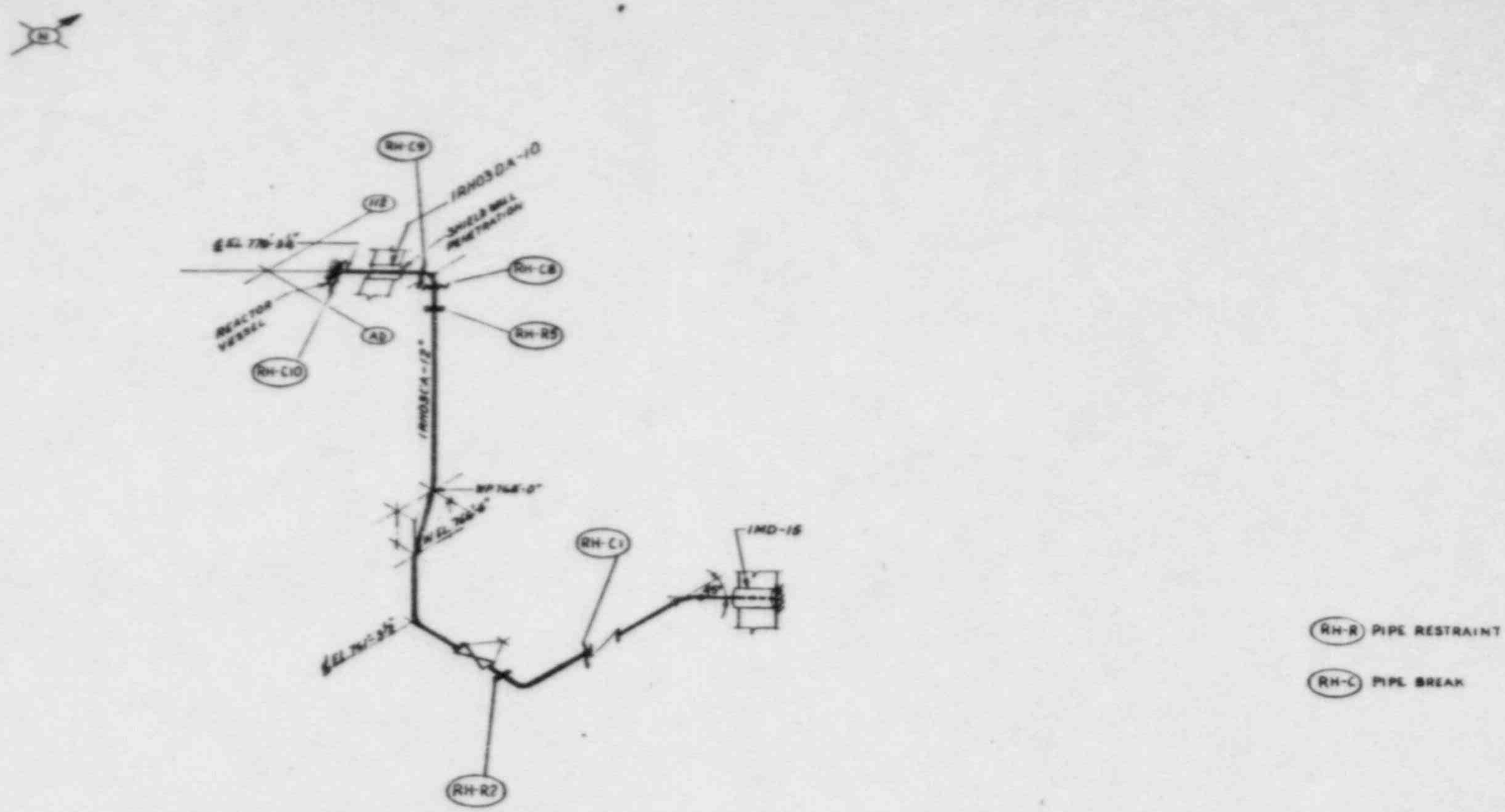
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-12

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS MAIN STEAM OUTSIDE CONTAINMENT

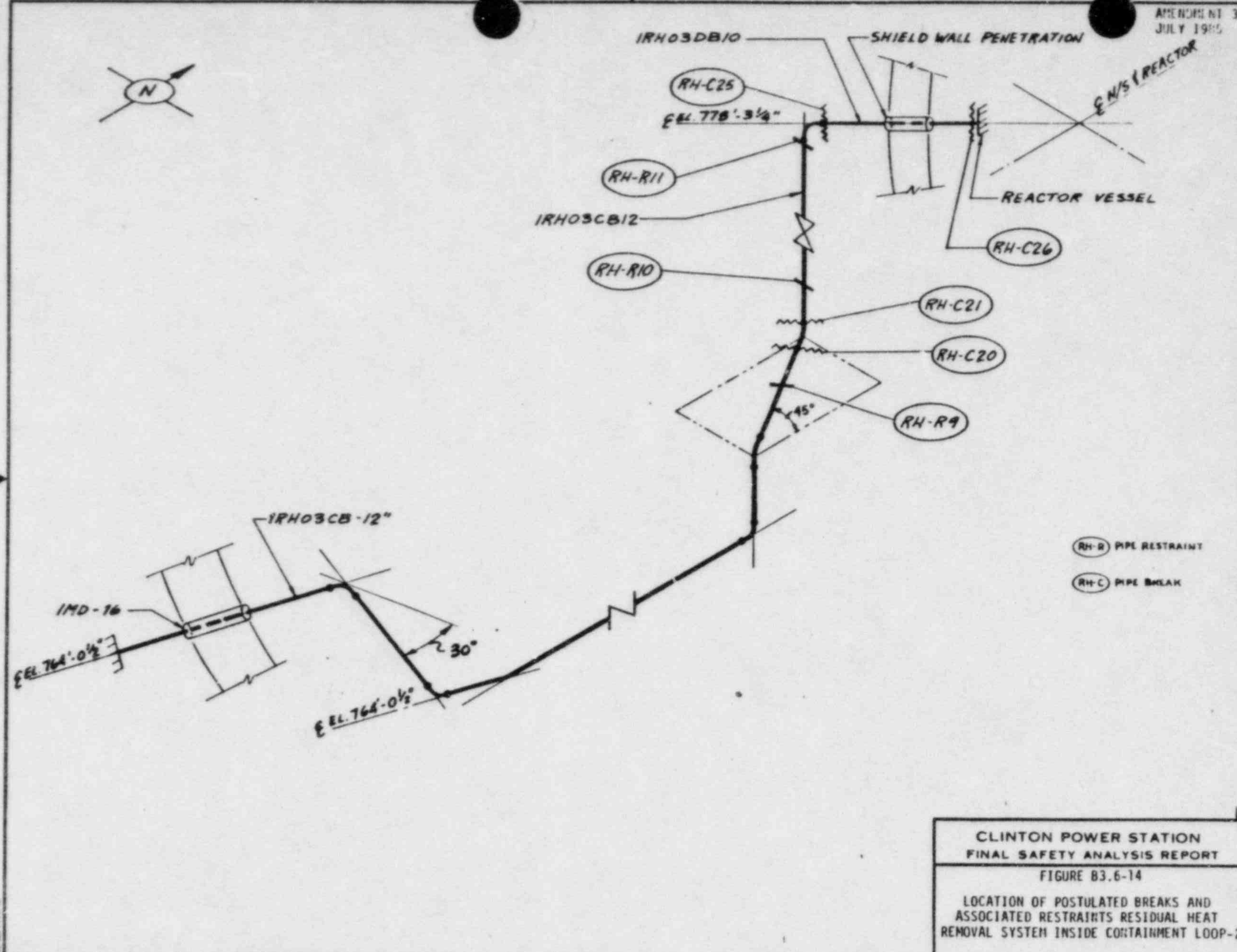


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-13

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS RESIDUAL HEAT REMOVAL SYSTEM INSIDE CONTAINMENT LOOP-1

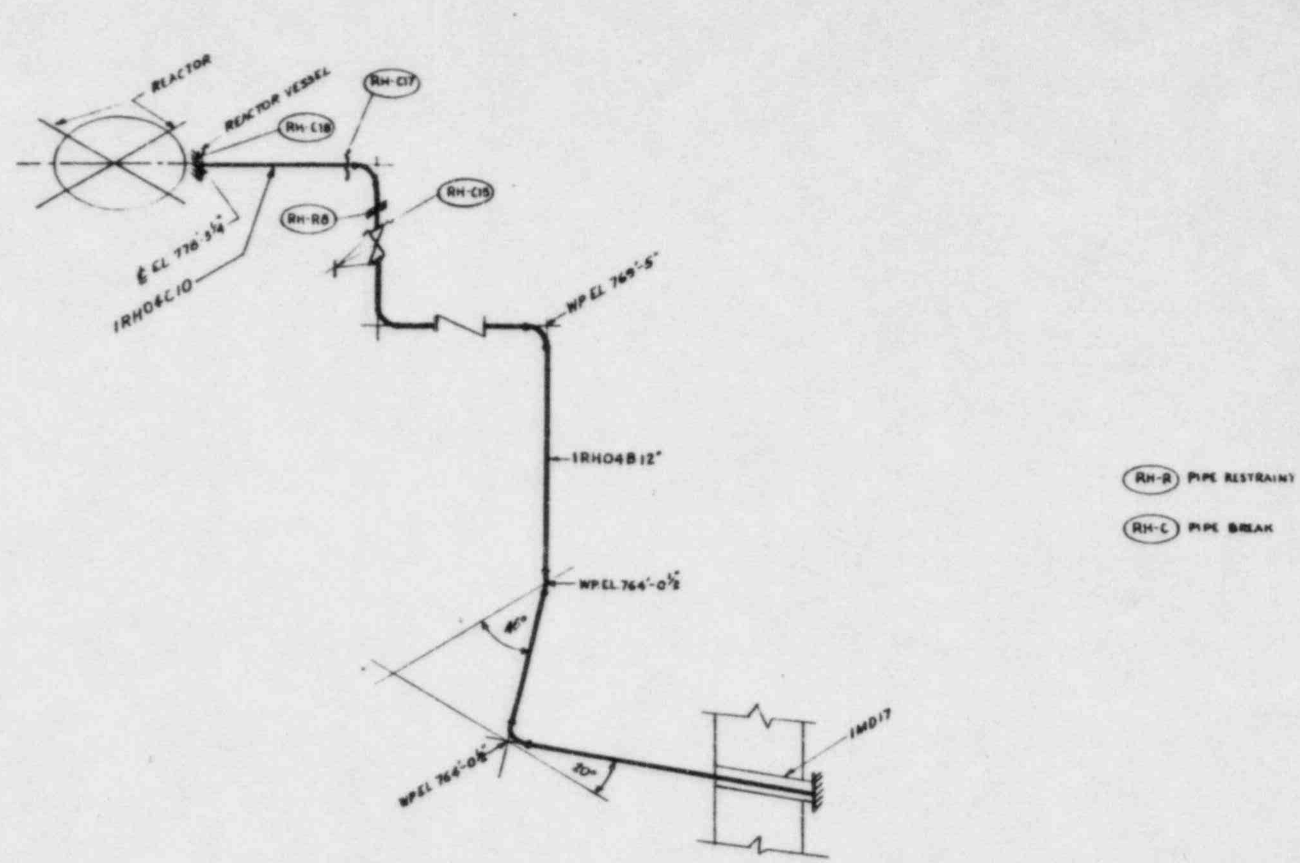
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-14

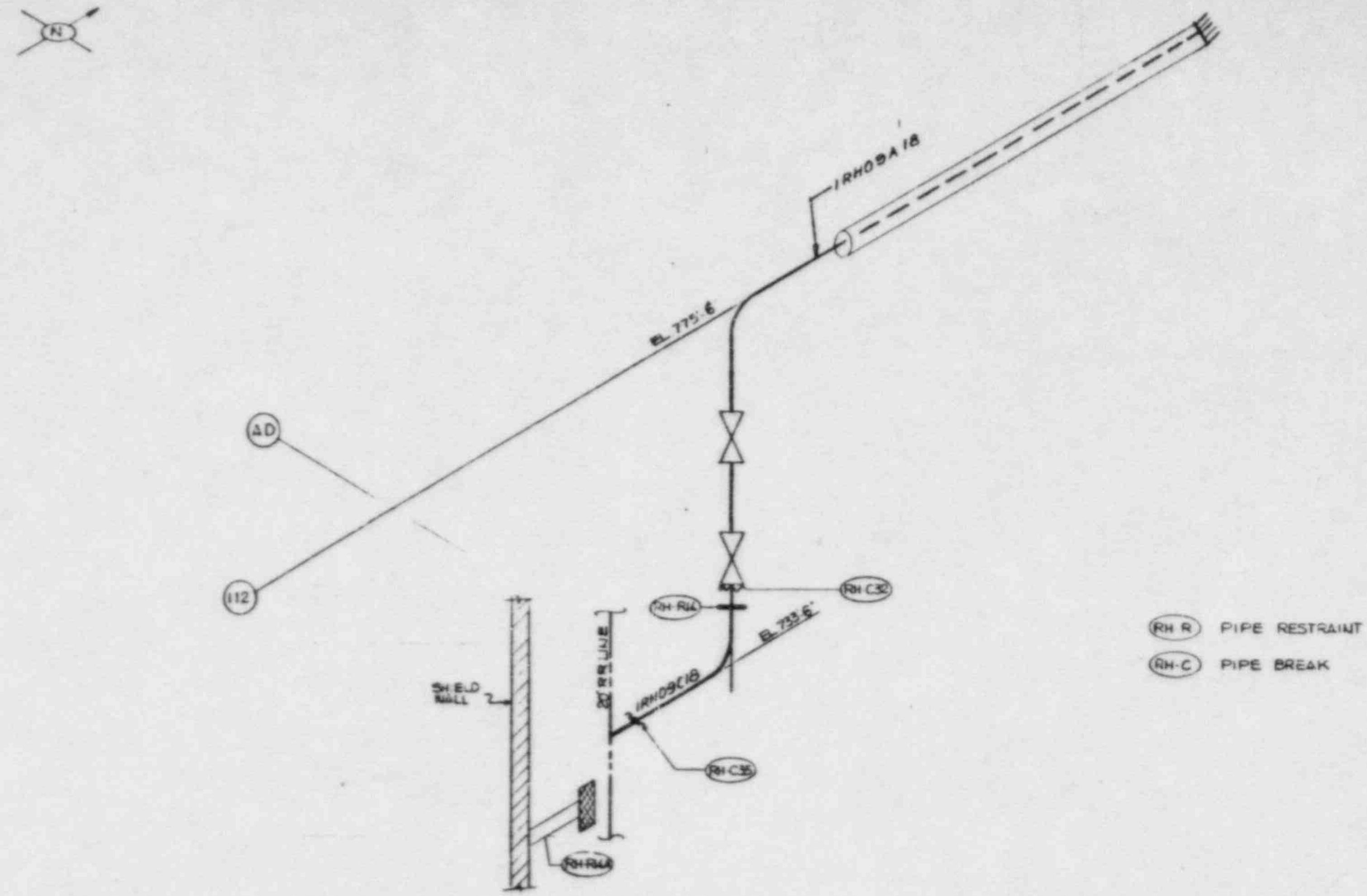
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS RESIDUAL HEAT REMOVAL SYSTEM INSIDE CONTAINMENT LOOP-2



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-15

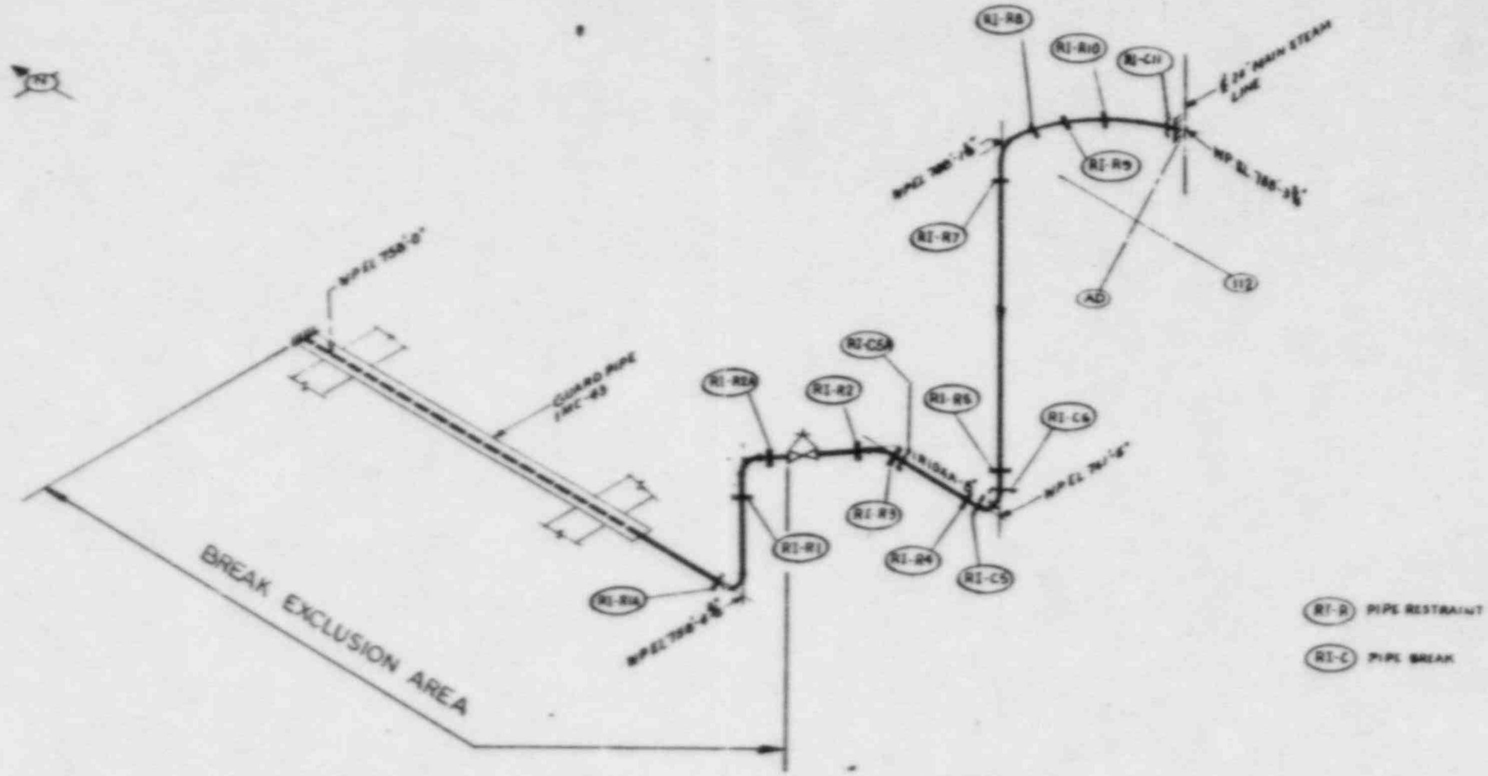
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS RESIDUAL HEAT REMOVAL SYSTEM INSIDE CONTAINMENT LOOP-3



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-16

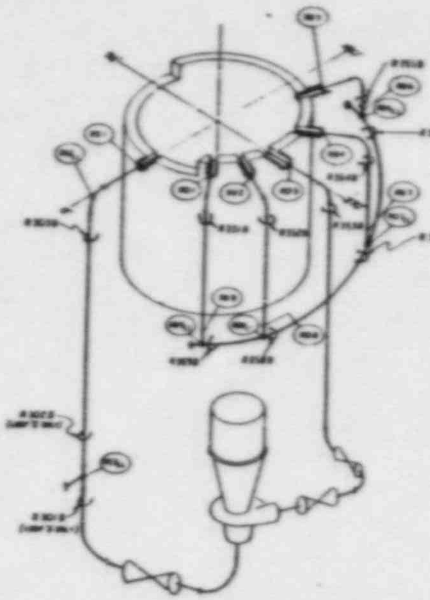
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS RESIDUAL HEAT REMOVAL SYSTEM INSIDE CONTAINMENT LOOP-4



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-17

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR CORE ISOLATION COOLING PIPING SYSTEM INSIDE CONTAINMENT



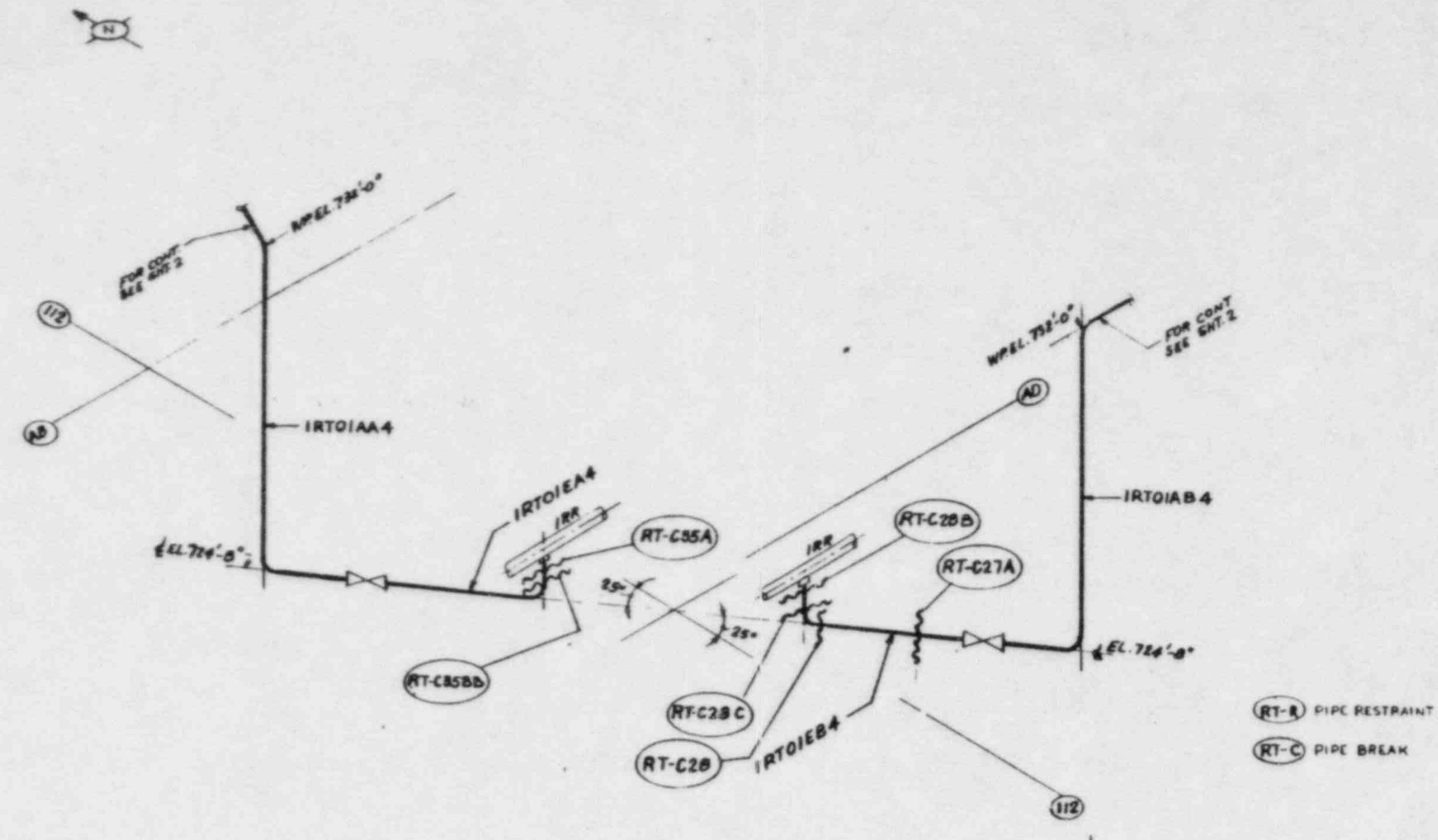
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
	[illegible]
[illegible]	[illegible]
	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

SUBSCRIPT 'LL' INDICATES LONGITUDAL BREAK

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-18

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR RECIRCULATION PIPING SYSTEM

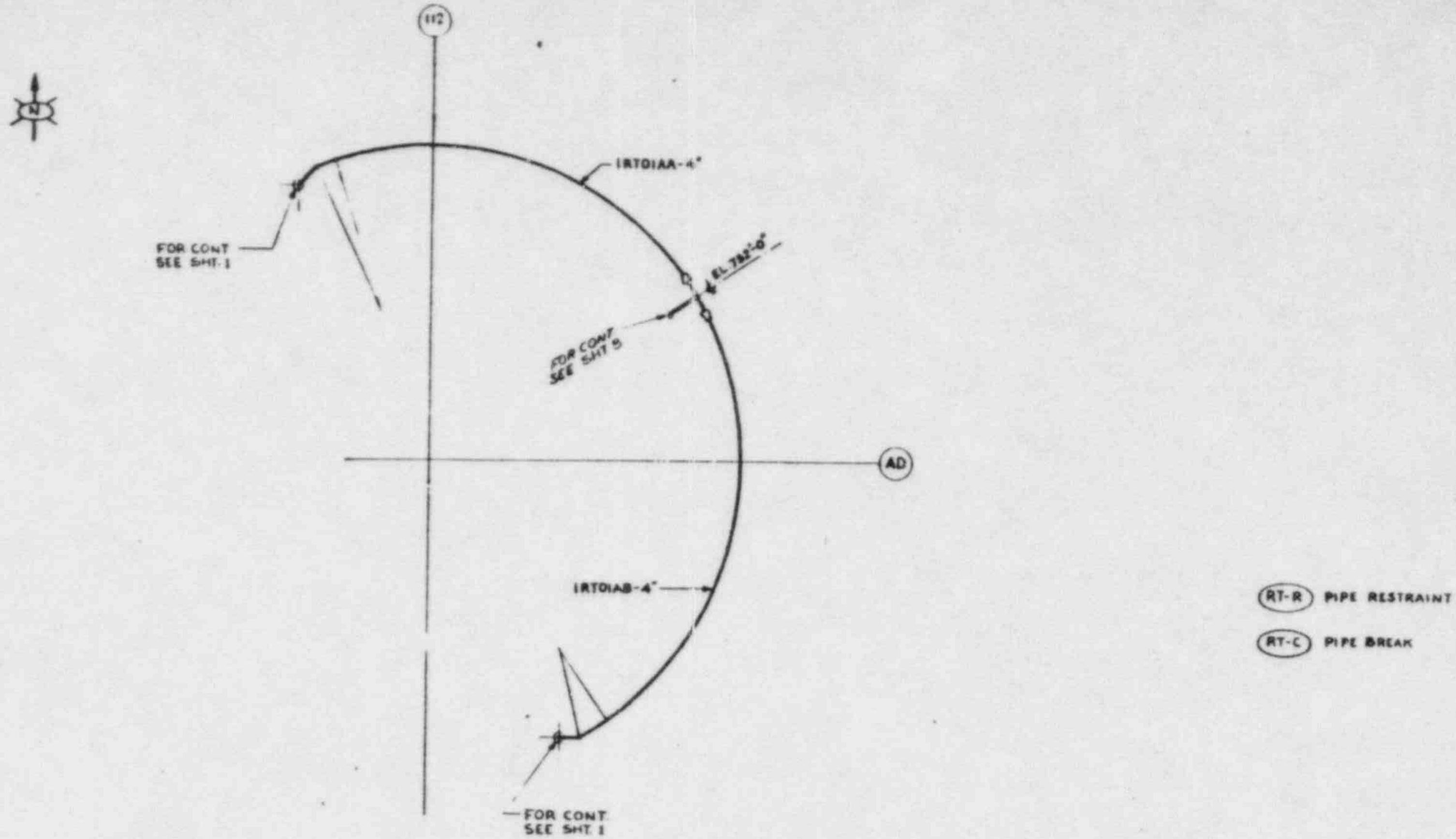


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-19

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR WATER CLEAN UP PIPING SYSTEM INSIDE CONTAINMENT (SHEET 1 OF 6)

AMENDMENT 34
JULY 1985

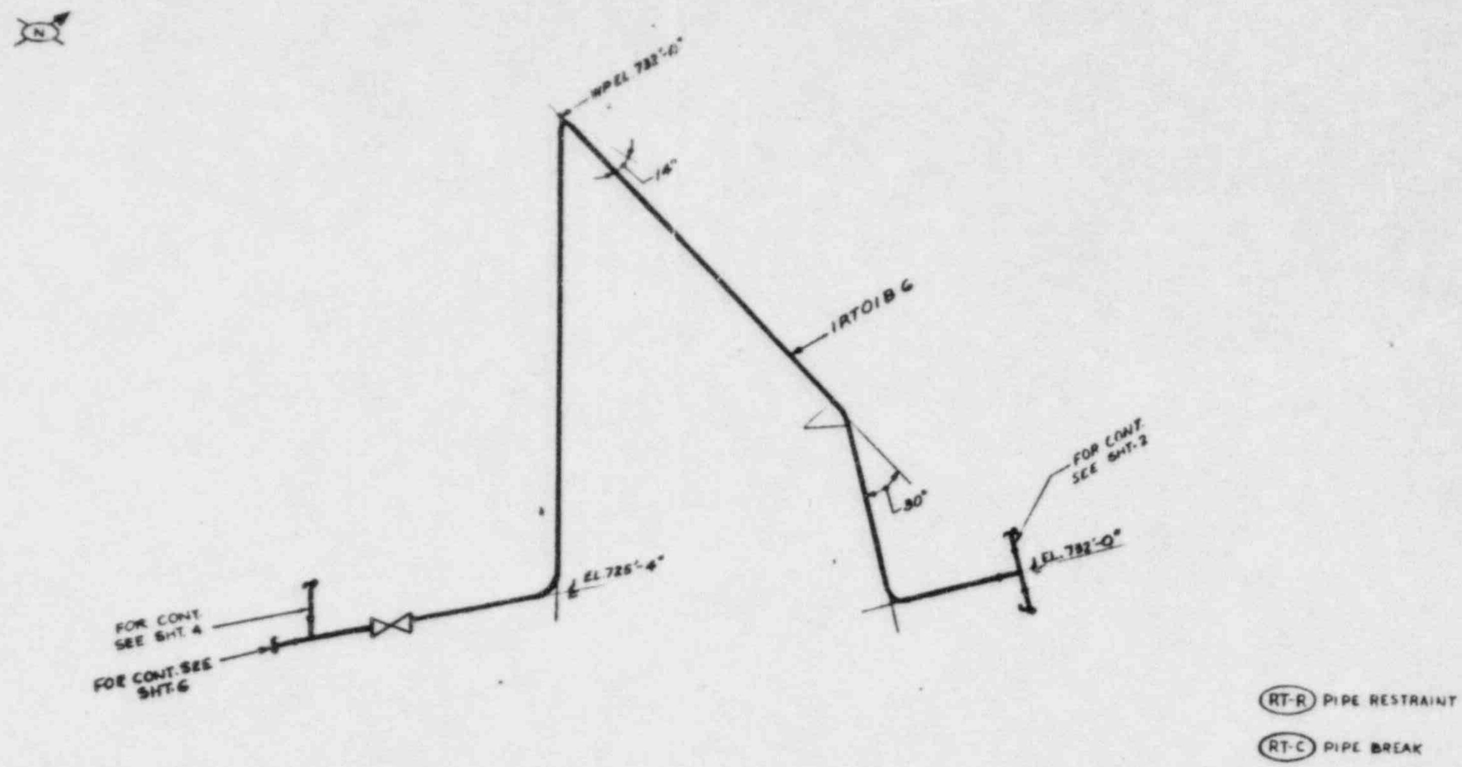


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-19

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR WATER CLEAN UP PIPING SYSTEM INSIDE CONTAINMENT (SHEET 2 OF 6)

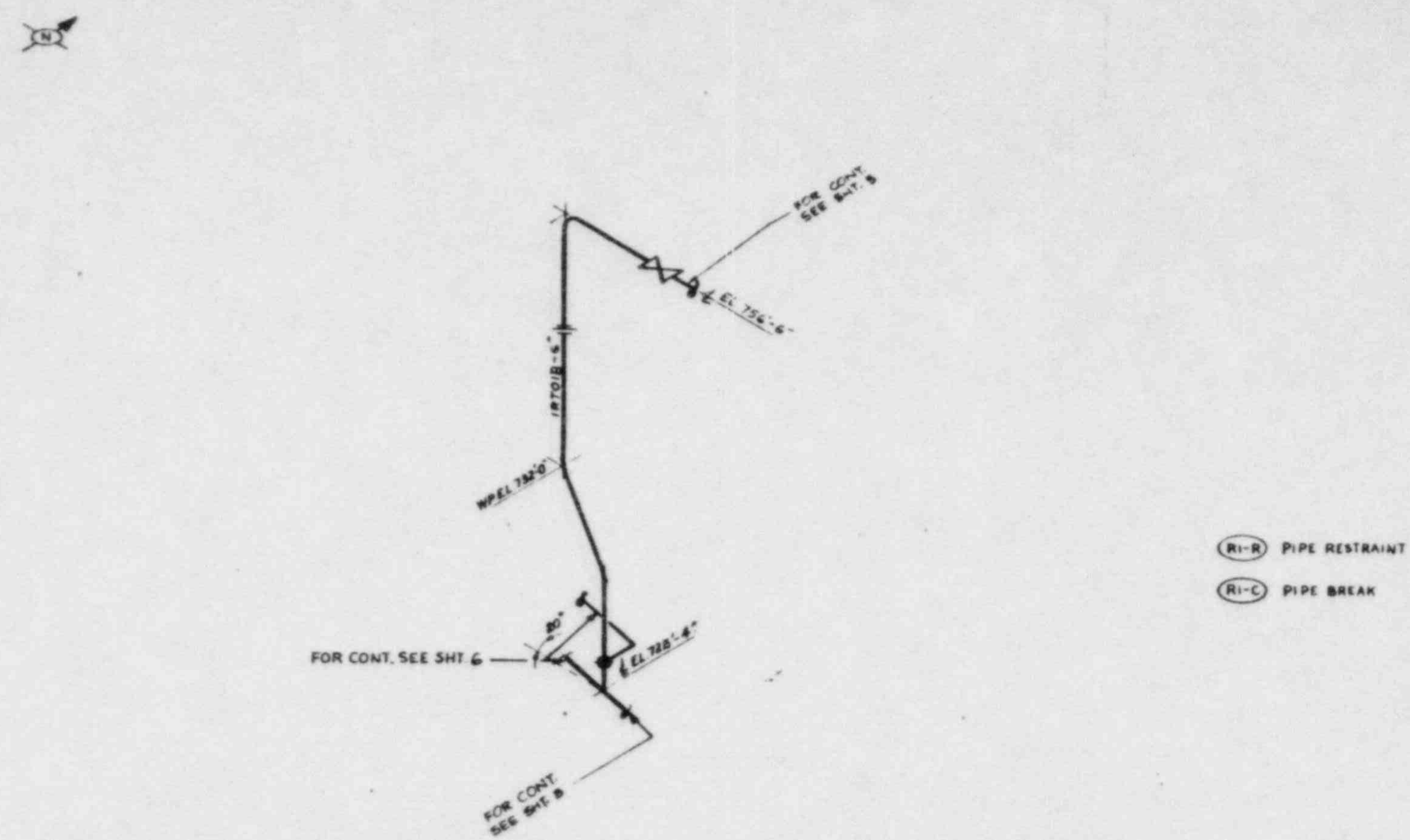
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-19

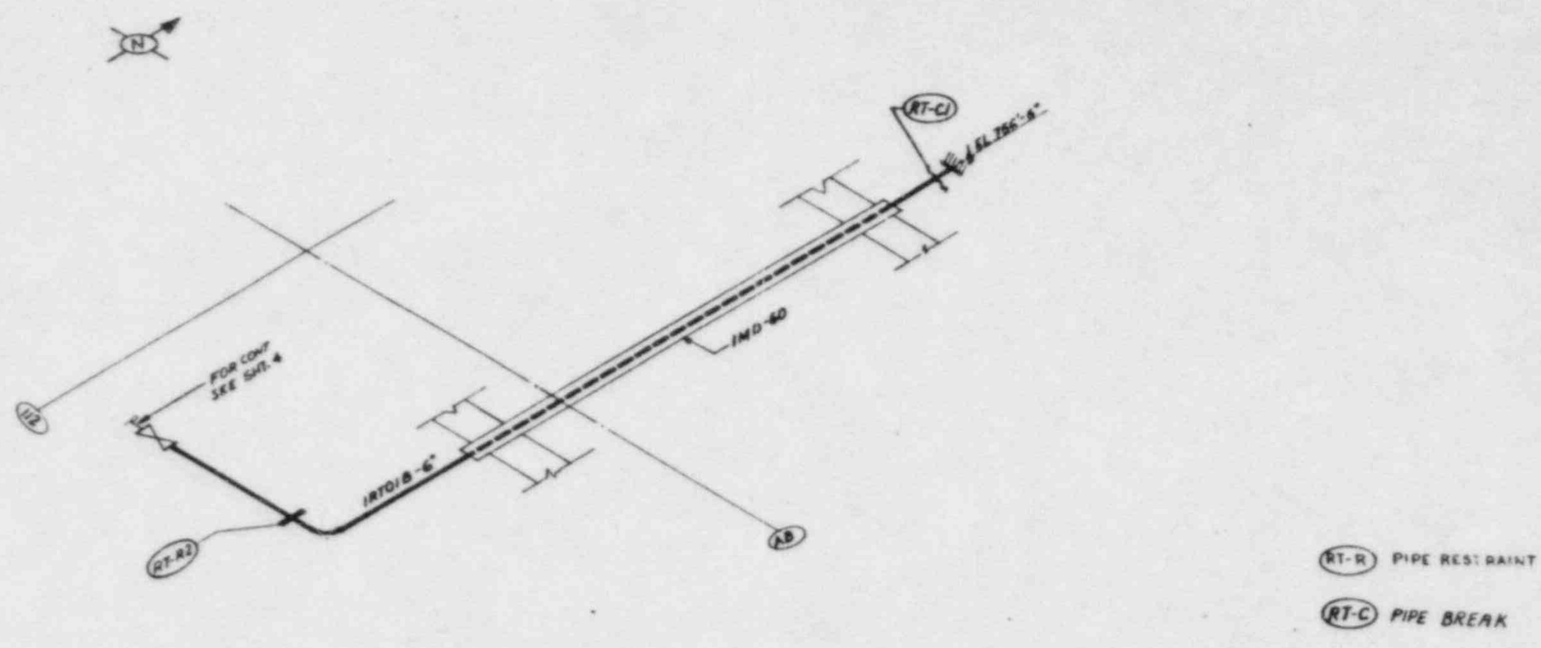
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR WATER CLEAN UP PIPING SYSTEM INSIDE CONTAINMENT (SHEET 3 OF 6)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-19

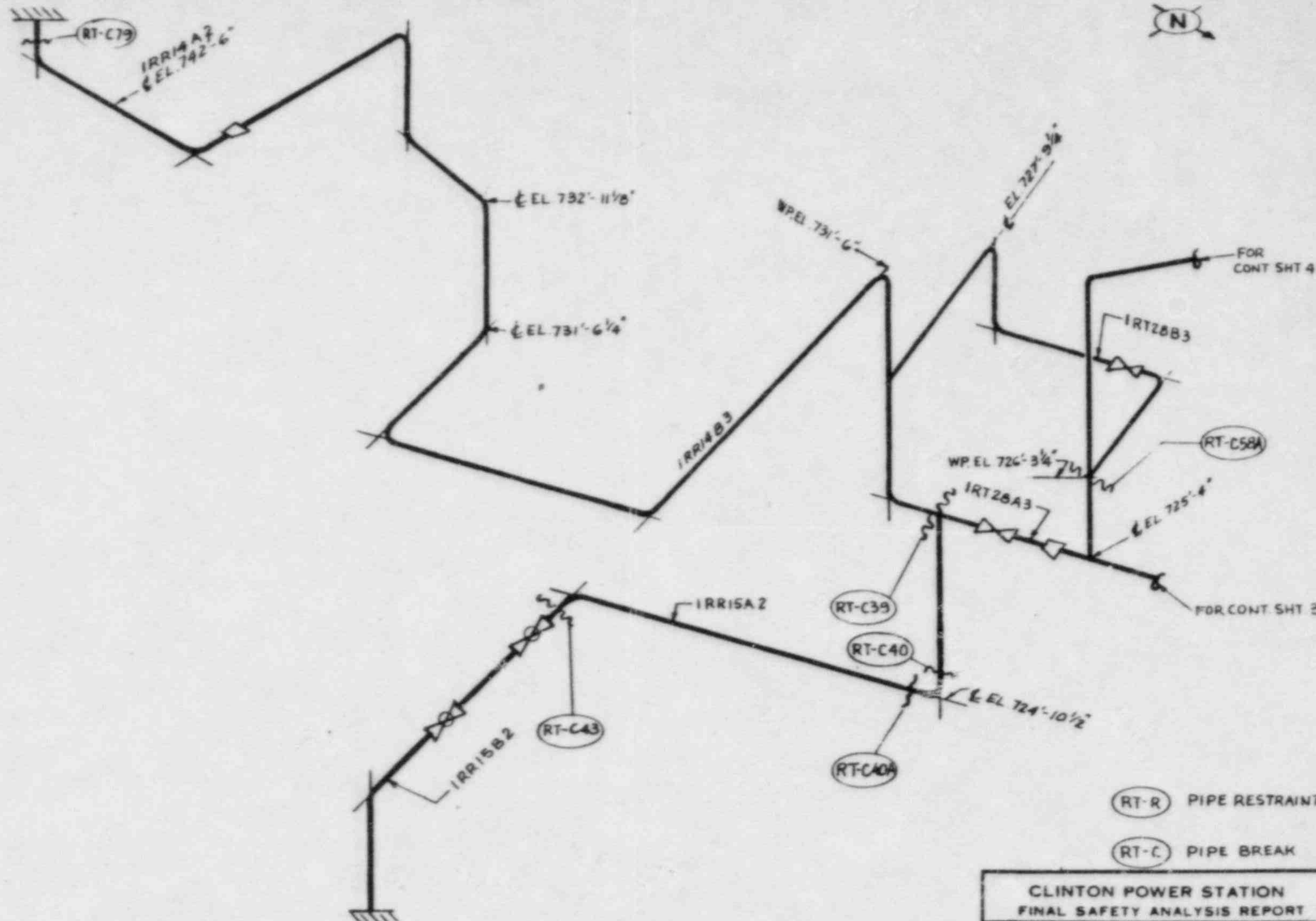
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR WATER CLEAN UP PIPING SYSTEM INSIDE CONTAINMENT (SHEET 4 OF 6)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-19

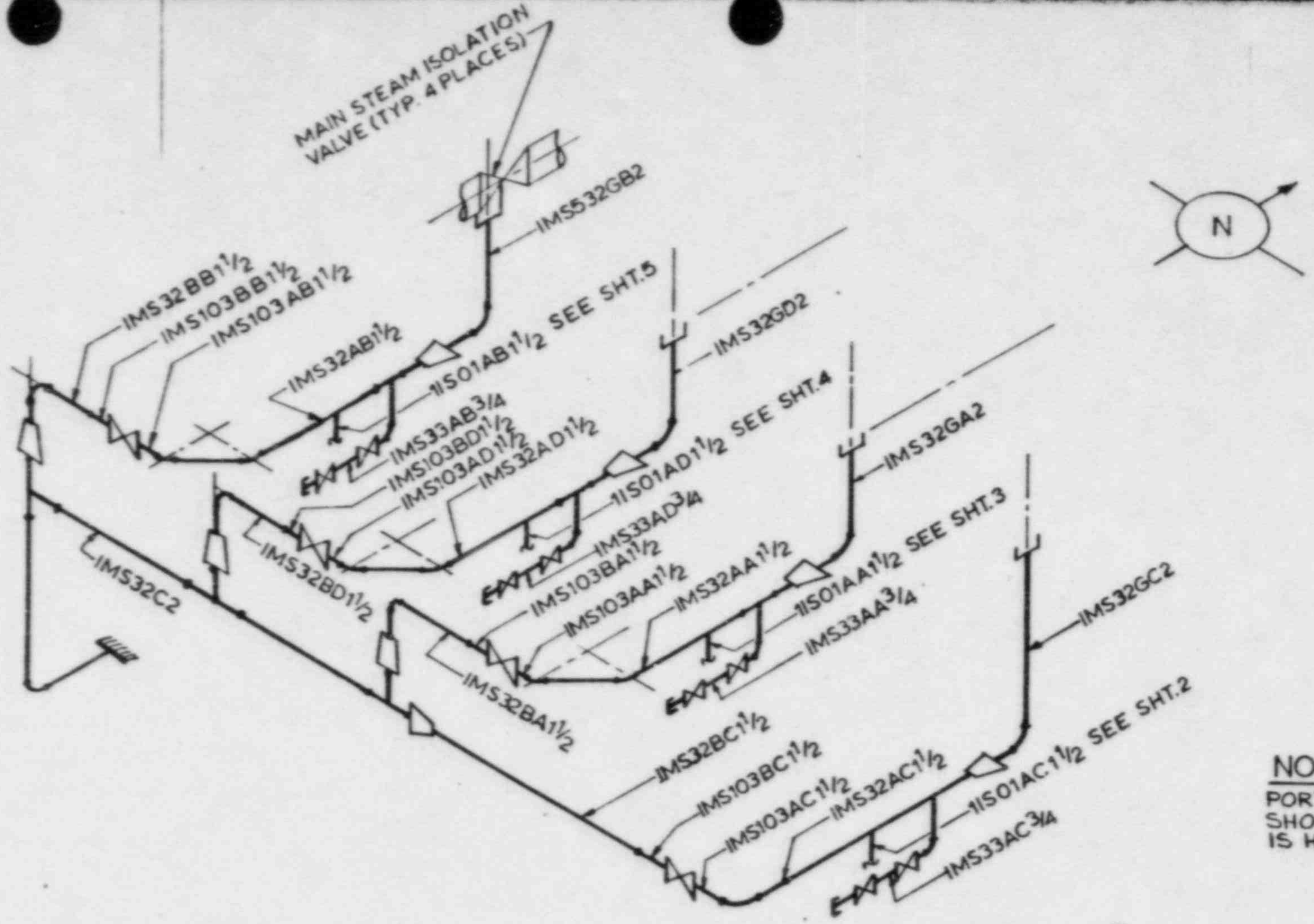
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR WATER CLEAN UP PIPING SYSTEM INSIDE CONTAINMENT (SHEET 5 OF 6)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-19

LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR WATER CLEAN UP PIPING SYSTEM INSIDE CONTAINMENT (SHEET 6 OF 6)



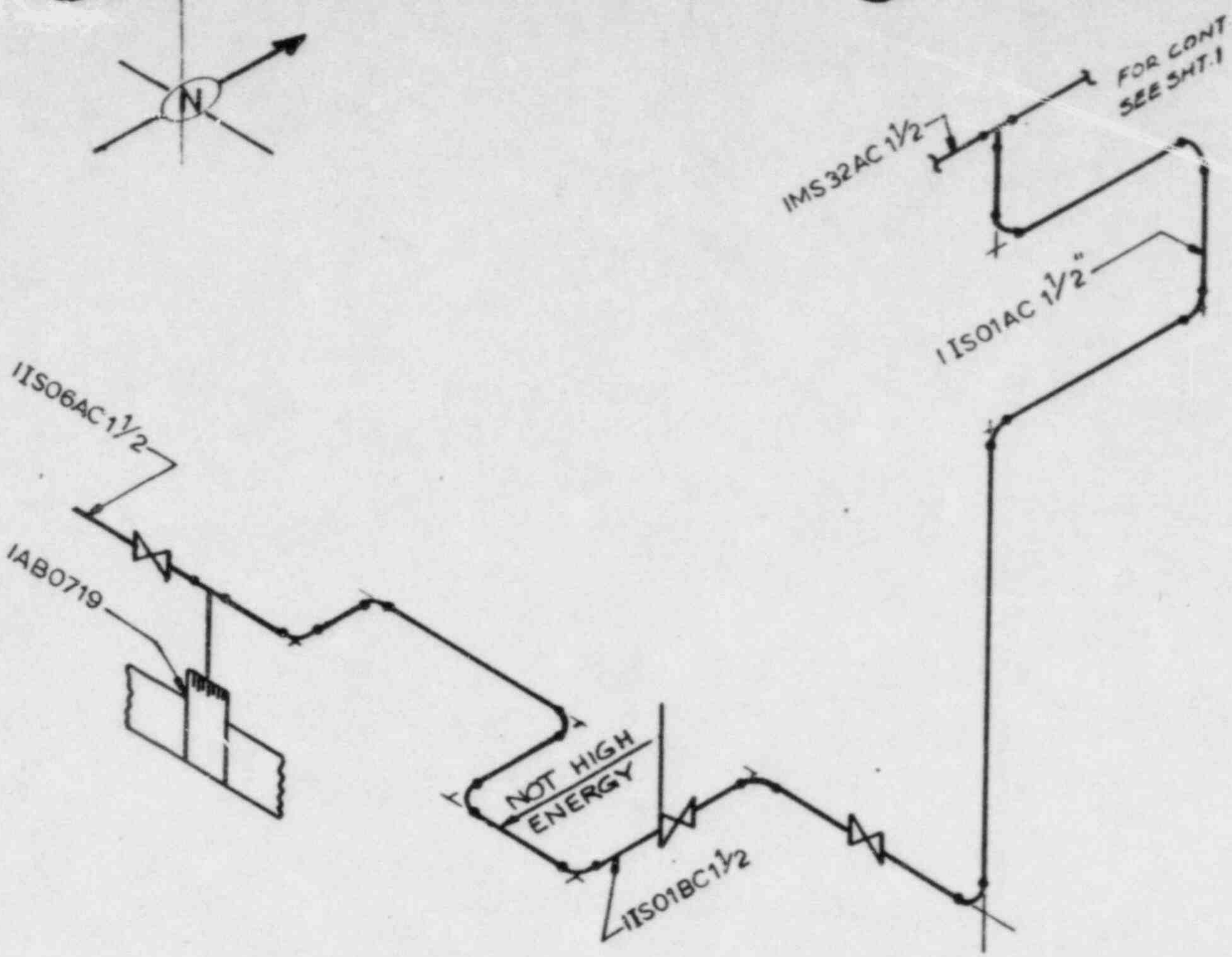
NOTE:
PORTION OF SUB-SYSTEM SHOWN ON THIS SHEET IS HIGH ENERGY.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-20

BREAK EXCLUSION AREA FOR MAIN STEAM DRAIN PIPING OUTSIDE CONTAINMENT FROM OUTSIDE MAIN STEAM ISOLATION VALVES

(SHEET 1 OF 5)

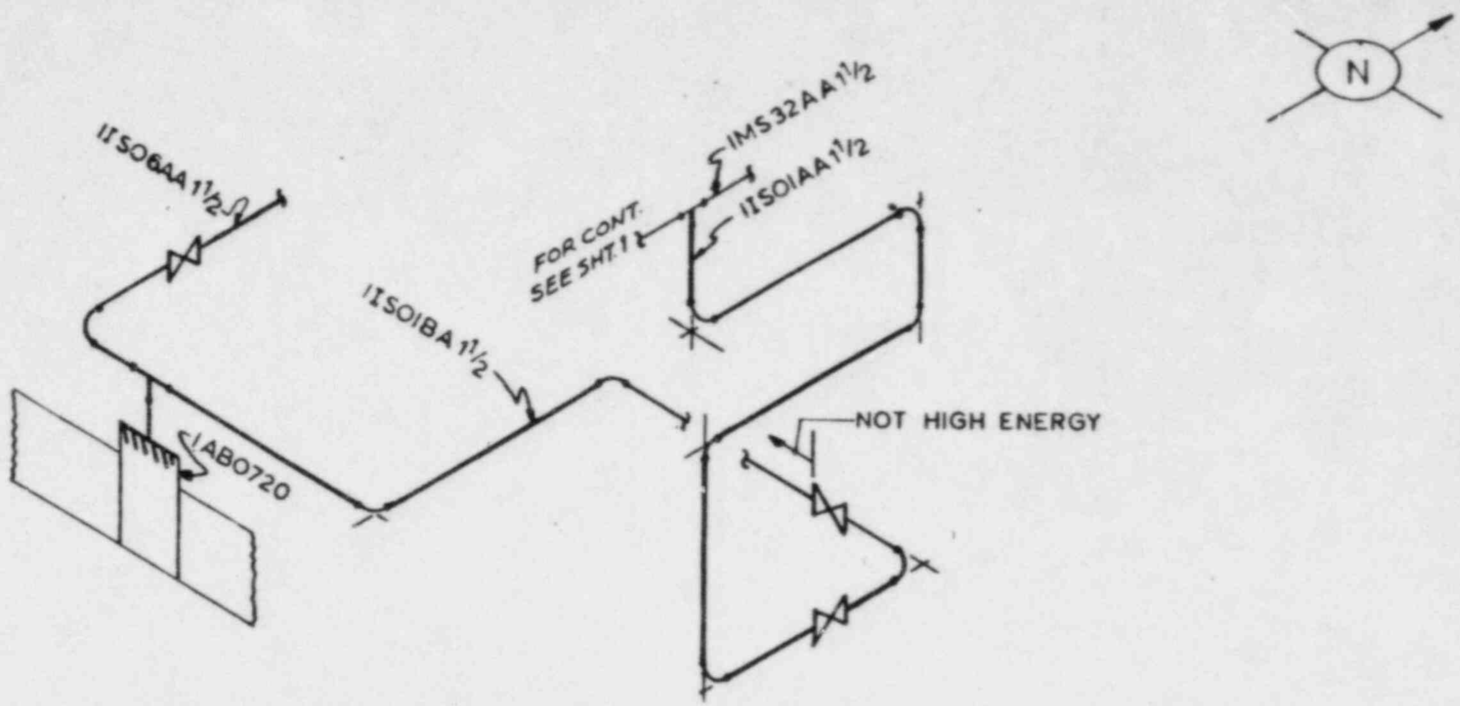


NOTE:
ENTIRE SUB-SYSTEM IS BREAK EXCLUSION AREA EXCEPT FOR PORTION OF SUB-SYSTEM THAT IS NOT HIGH ENERGY.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-20
BREAK EXCLUSION AREA FOR MAIN STEAM DRAIN PIPING OUTSIDE CONTAINMENT FROM OUTSIDE MAIN STEAM ISOLATION VALVES
(SHEET 2 OF 5)

AMENDMENT 34
JULY 1985



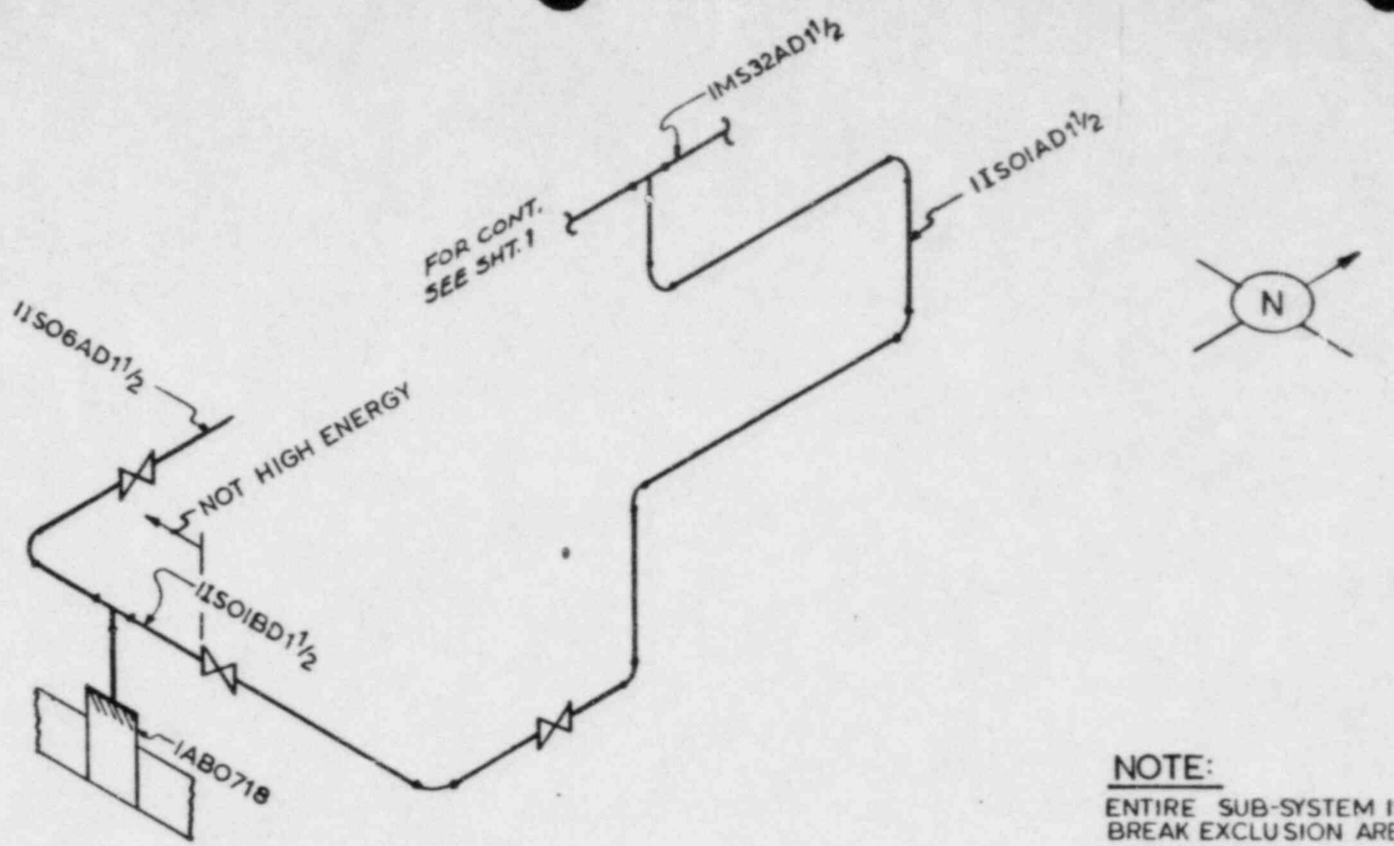
NOTE:
ENTIRE SUB-SYSTEM IS BREAK EXCLUSION AREA EXCEPT FOR PORTION OF SUB SYSTEM, THAT IS NOT HIGH ENERGY.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-20

BREAK EXCLUSION AREA FOR MAIN STEAM DRAIN PIPING OUTSIDE CONTAINMENT FROM OUTSIDE MAIN STEAM ISOLATION VALVES

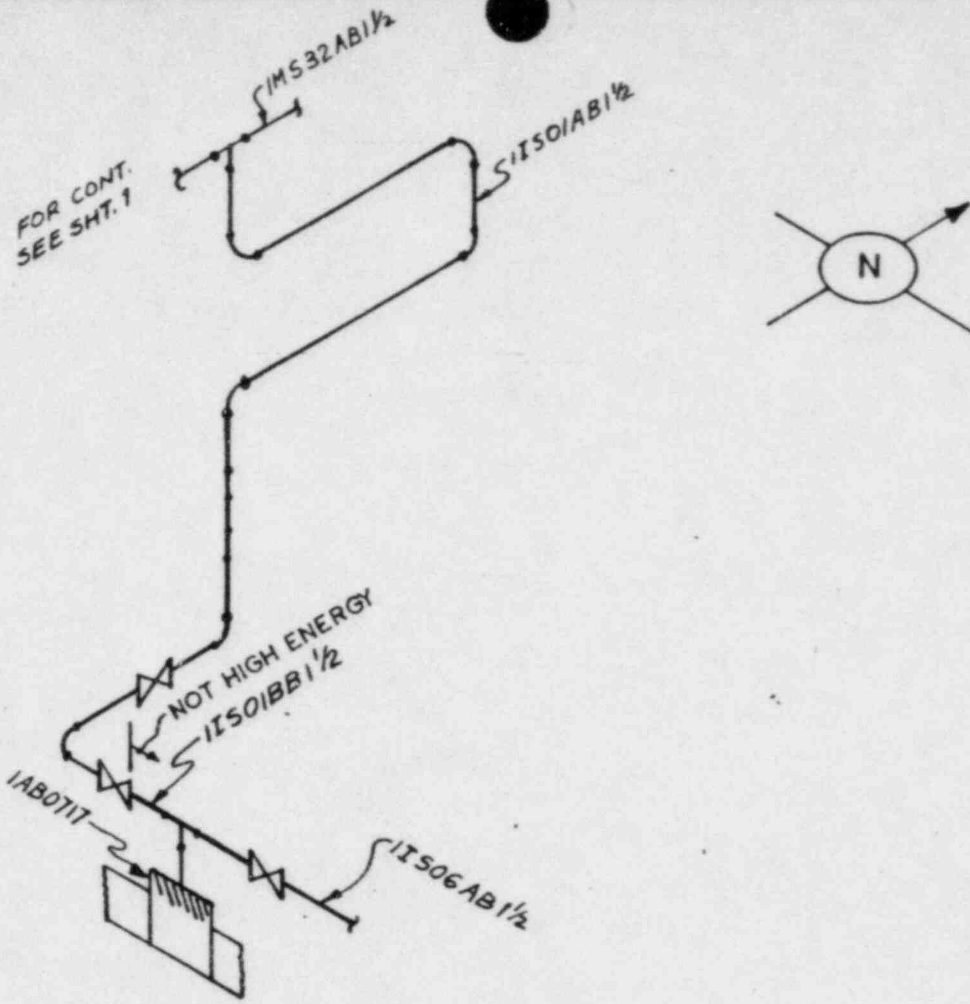
(SHEET 3 OF 5)



NOTE:
ENTIRE SUB-SYSTEM IS BREAK EXCLUSION AREA EXCEPT FOR PORTION OF SUB-SYSTEM THAT IS NOT HIGH ENERGY.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-20
BREAK EXCLUSION AREA FOR MAIN STEAM DRAIN PIPING OUTSIDE CONTAINMENT FROM OUTSIDE MAIN STEAM ISOLATION VALVES
(SHEET 4 OF 5)



NOTE:

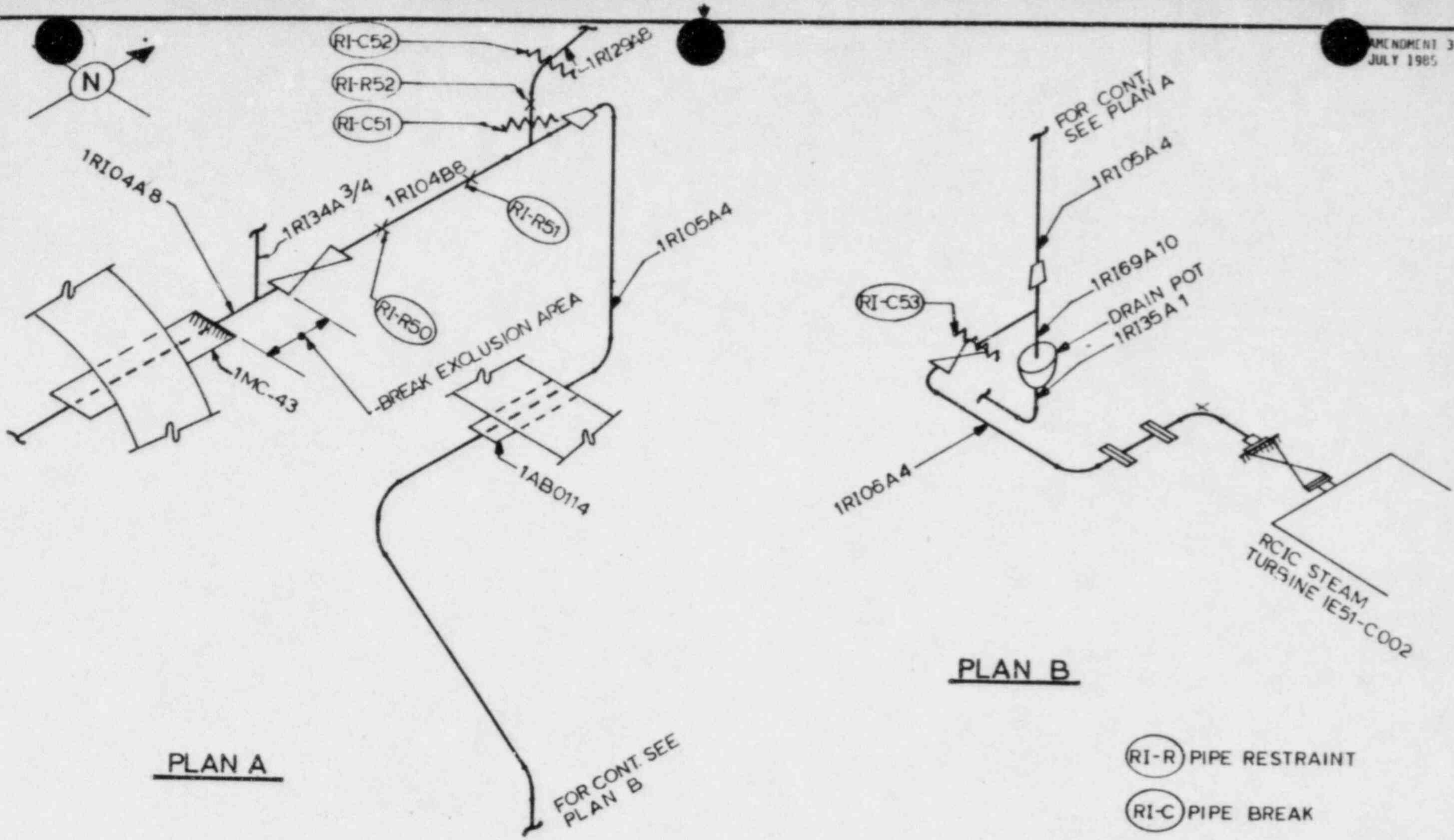
ENTIRE SUB-SYSTEM IS BREAK EXCLUSION AREA EXCEPT FOR PORTION OF SUB SYSTEM THAT IS NOT HIGH ENERGY.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-20

BREAK EXCLUSION AREA FOR MAIN STEAM DRAIN PIPING OUTSIDE CONTAINMENT FROM OUTSIDE MAIN STEAM ISOLATION VALVES

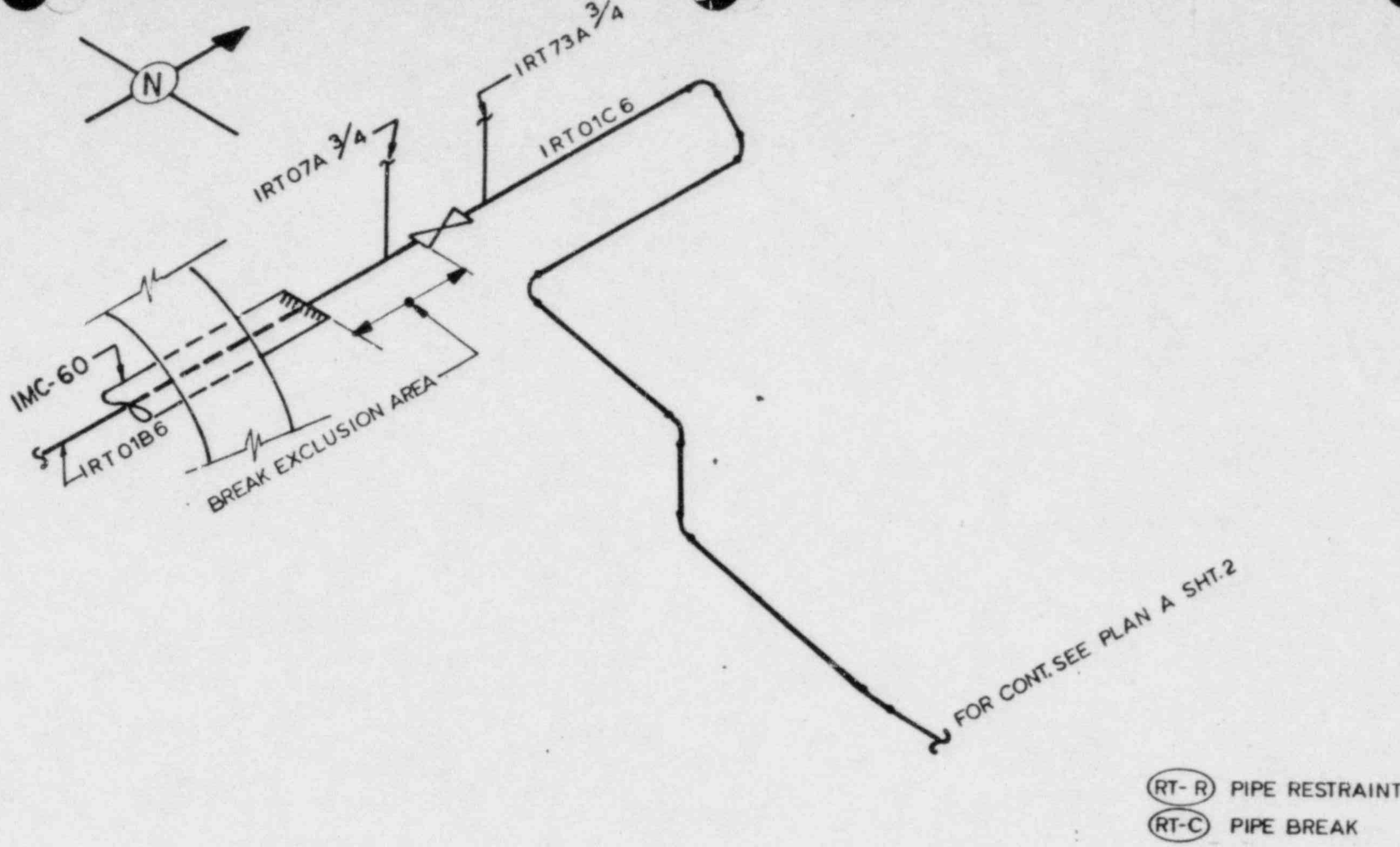
(SHEET 5 OF 5)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-21

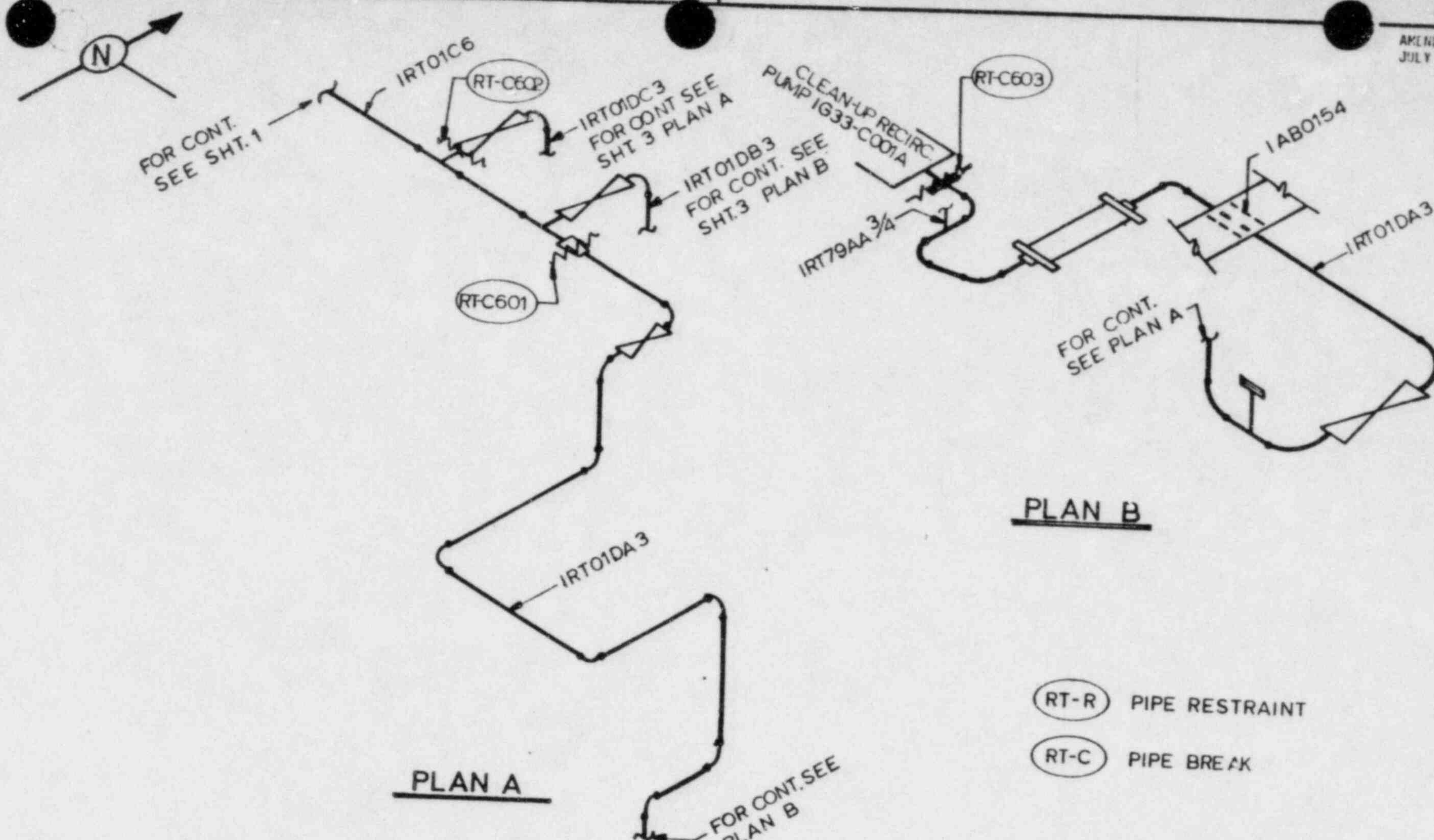
LOCATION OF POSTULATED BREAKS AND ASSOCIATED RESTRAINTS REACTOR CORE ISOLATION COOLING PIPING OUTSIDE CONTAINMENT



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-22

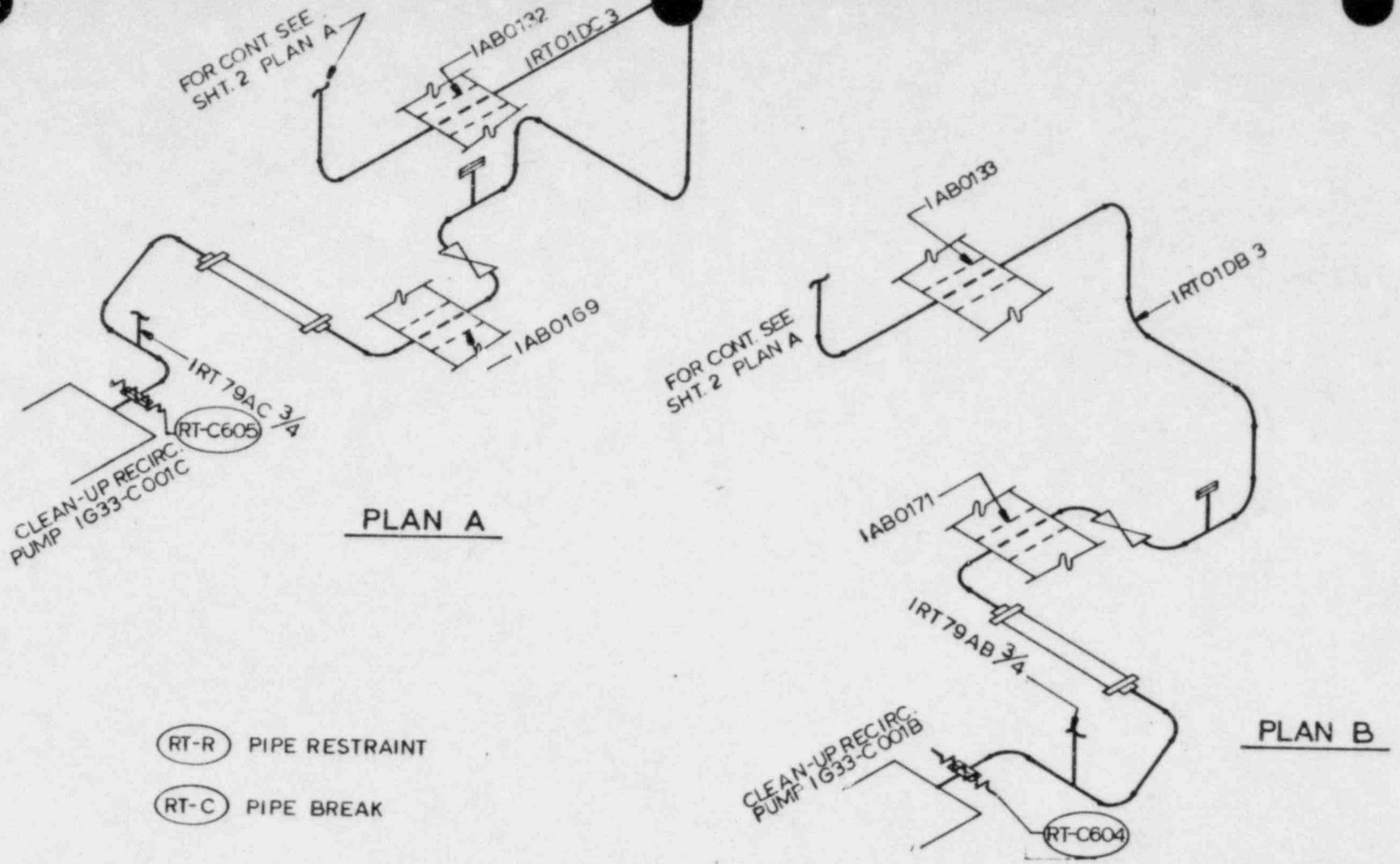
LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING OUTSIDE CONTAINMENT
(SHEET 1 OF 3)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-22

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING OUTSIDE CONTAINMENT
(SHEET 2 OF 3)



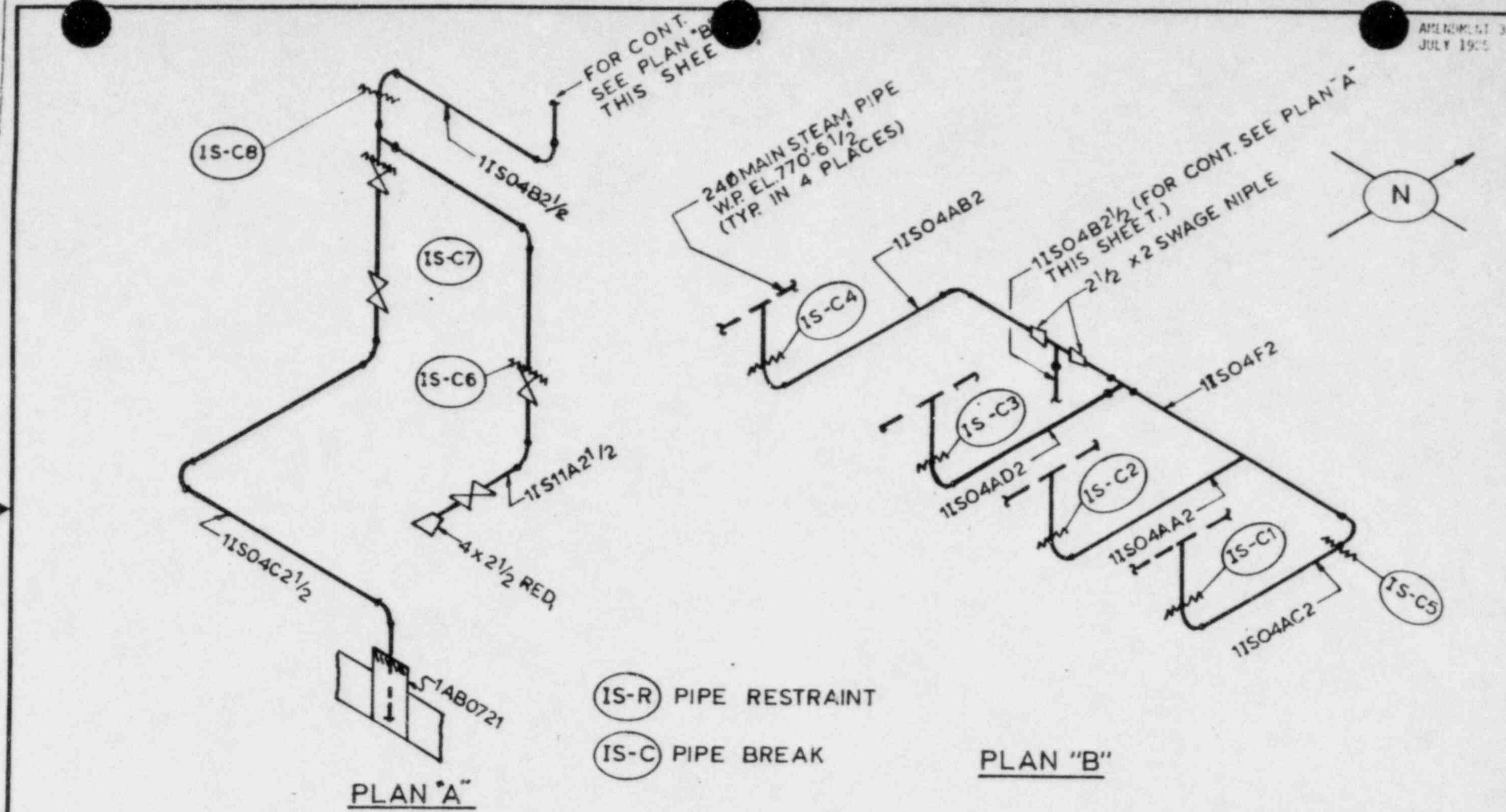
CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-22

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING OUTSIDE CONTAINMENT

(SHEET 3 OF 3)

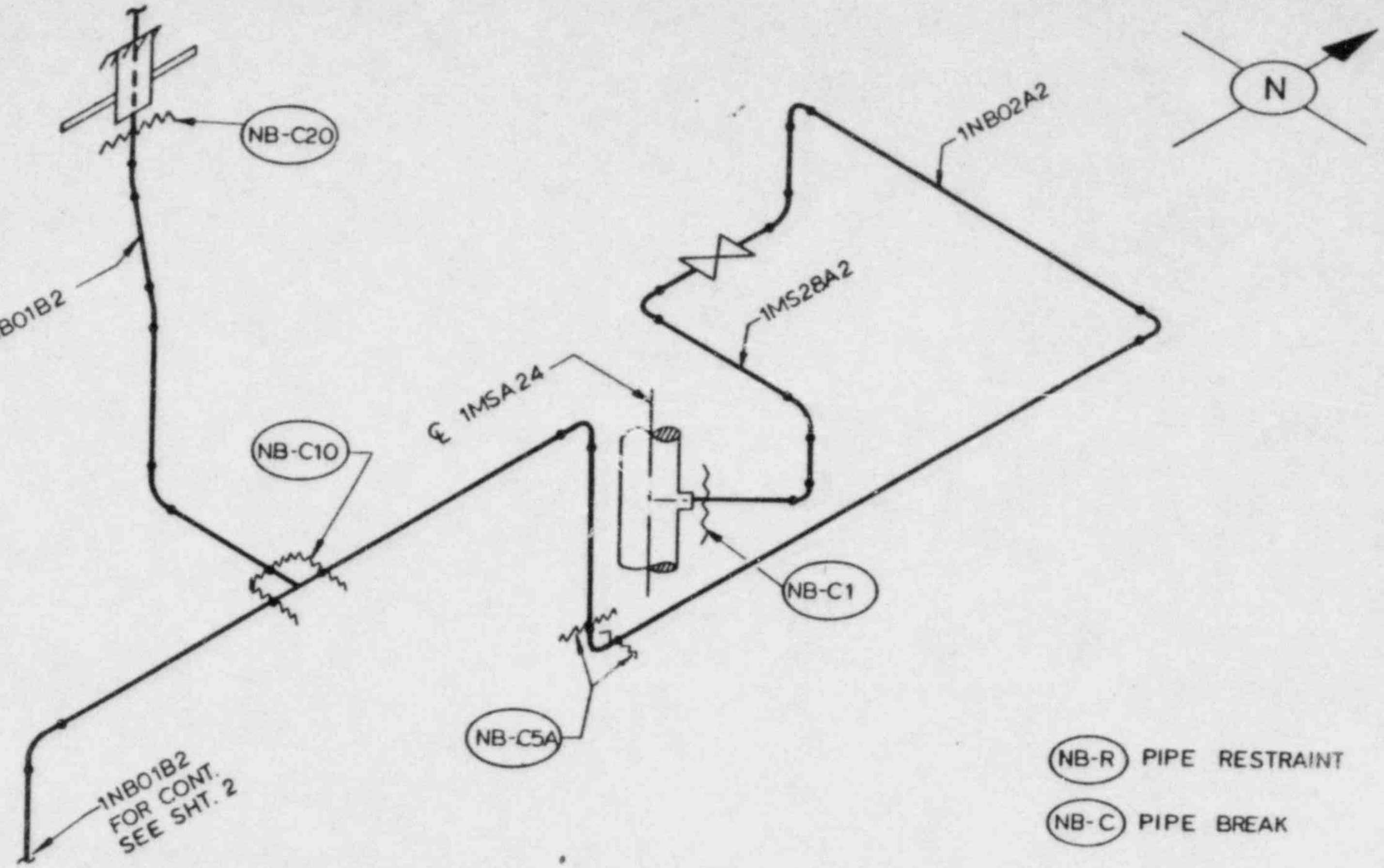
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

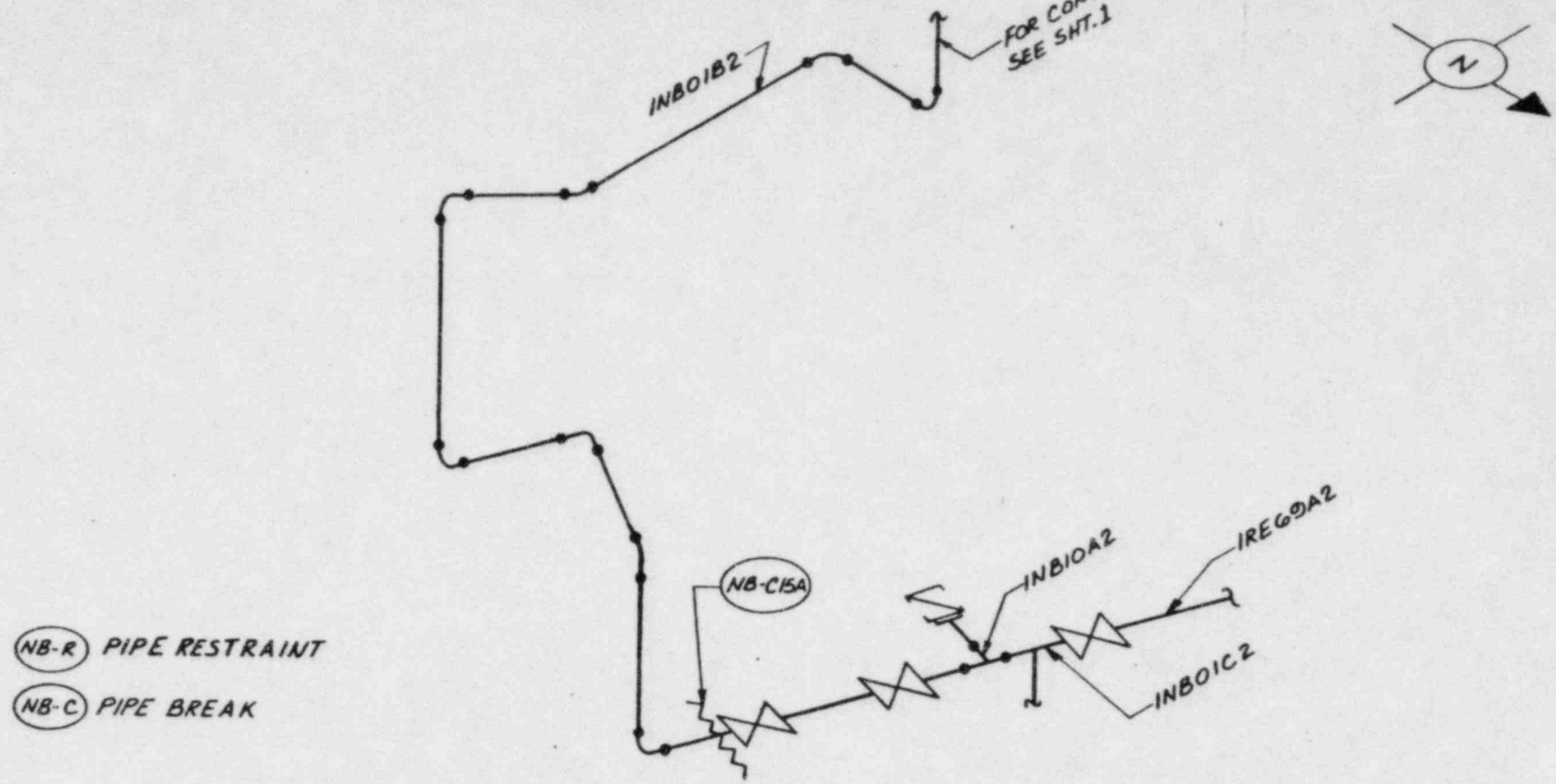
FIGURE B3.6-23

LOCATION OF POSTULATED BREAKS MSIV LEAKAGE CONTROL PIPING OUTSIDE CONTAINMENT



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-24
LOCATION OF POSTULATED BREAKS
NUCLEAR BOILER PIPING
INSIDE CONTAINMENT
(SHEET 1 OF 2)

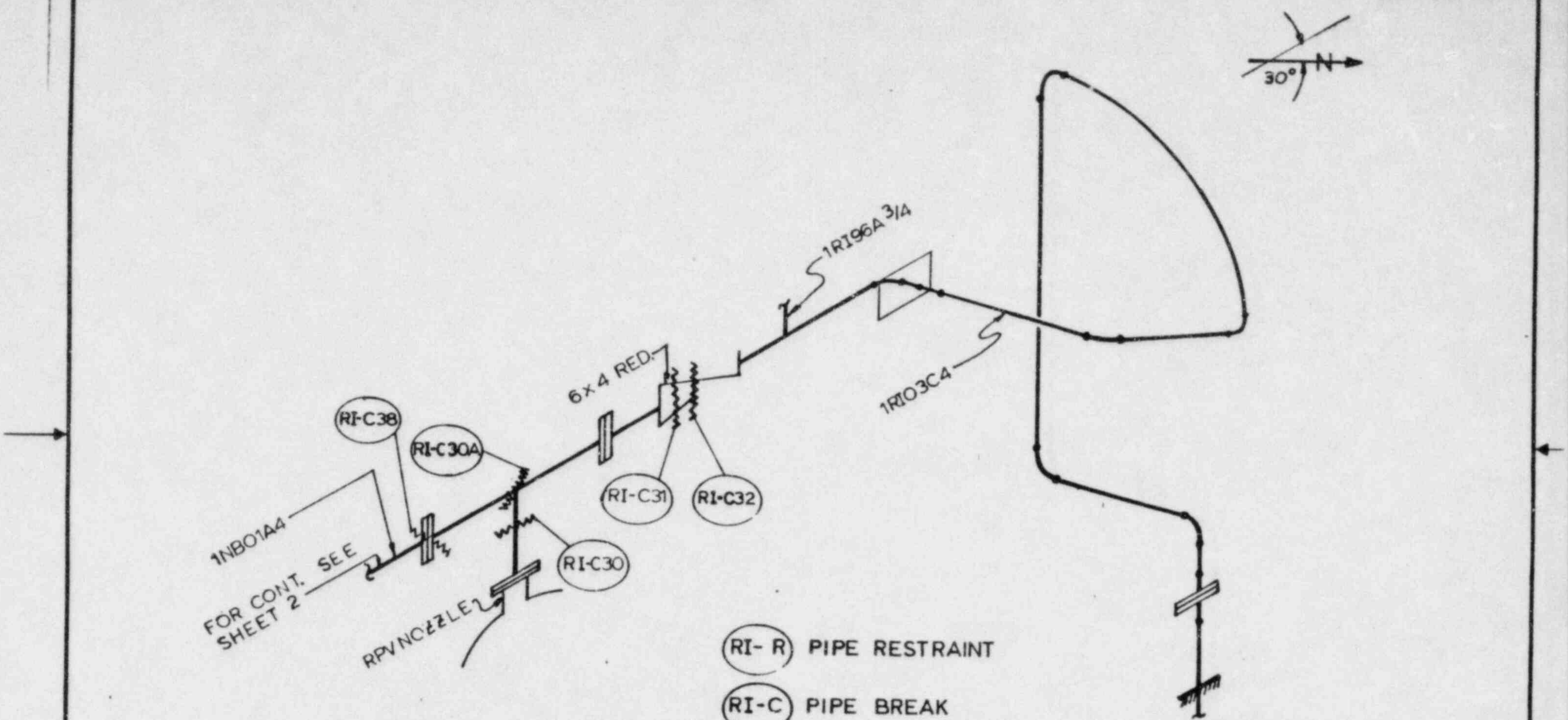


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-24
LOCATION OF POSTULATED BREAKS
NUCLEAR BOILER PIPING
INSIDE CONTAINMENT

(SHEET 2 OF 2)

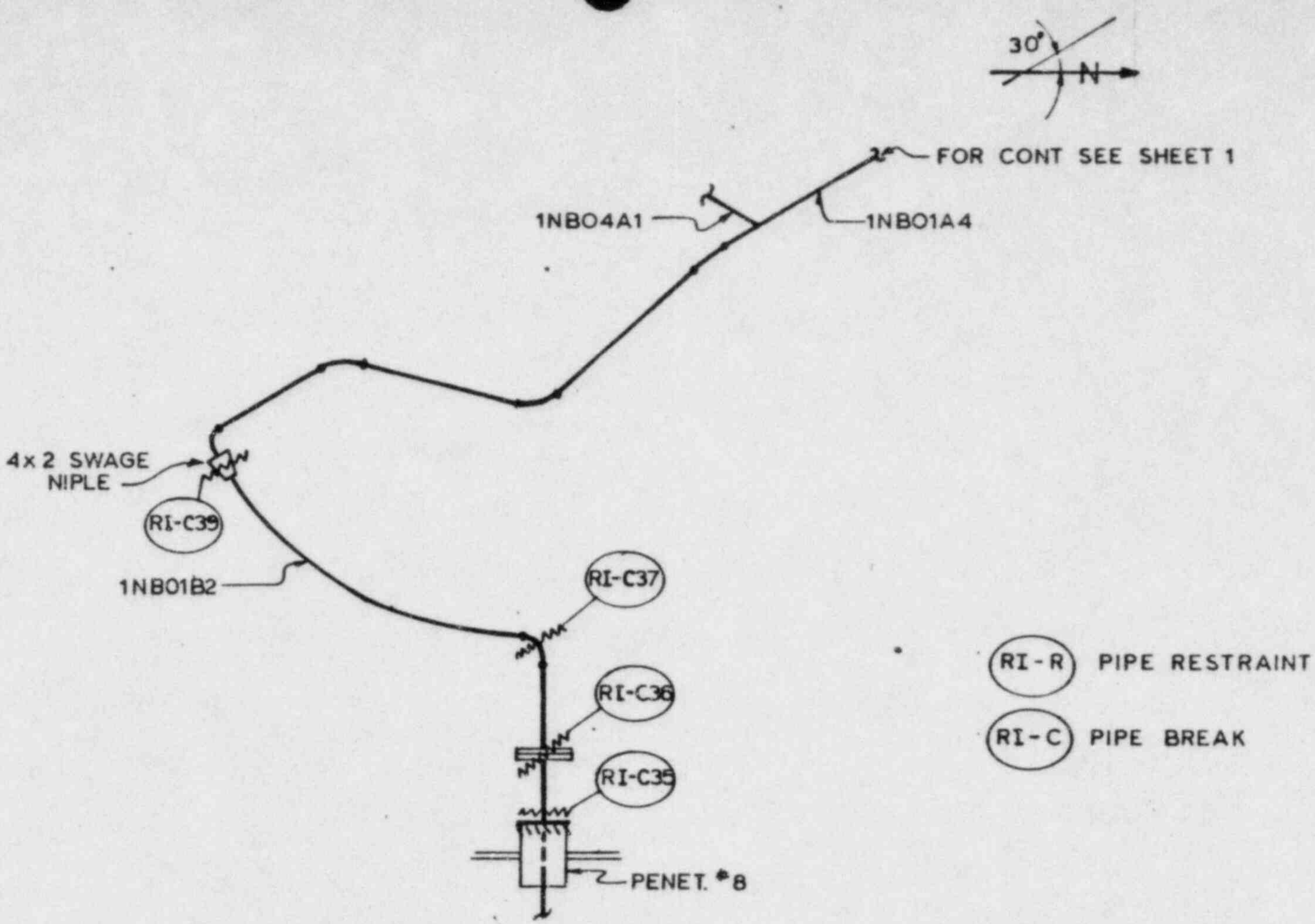
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-25

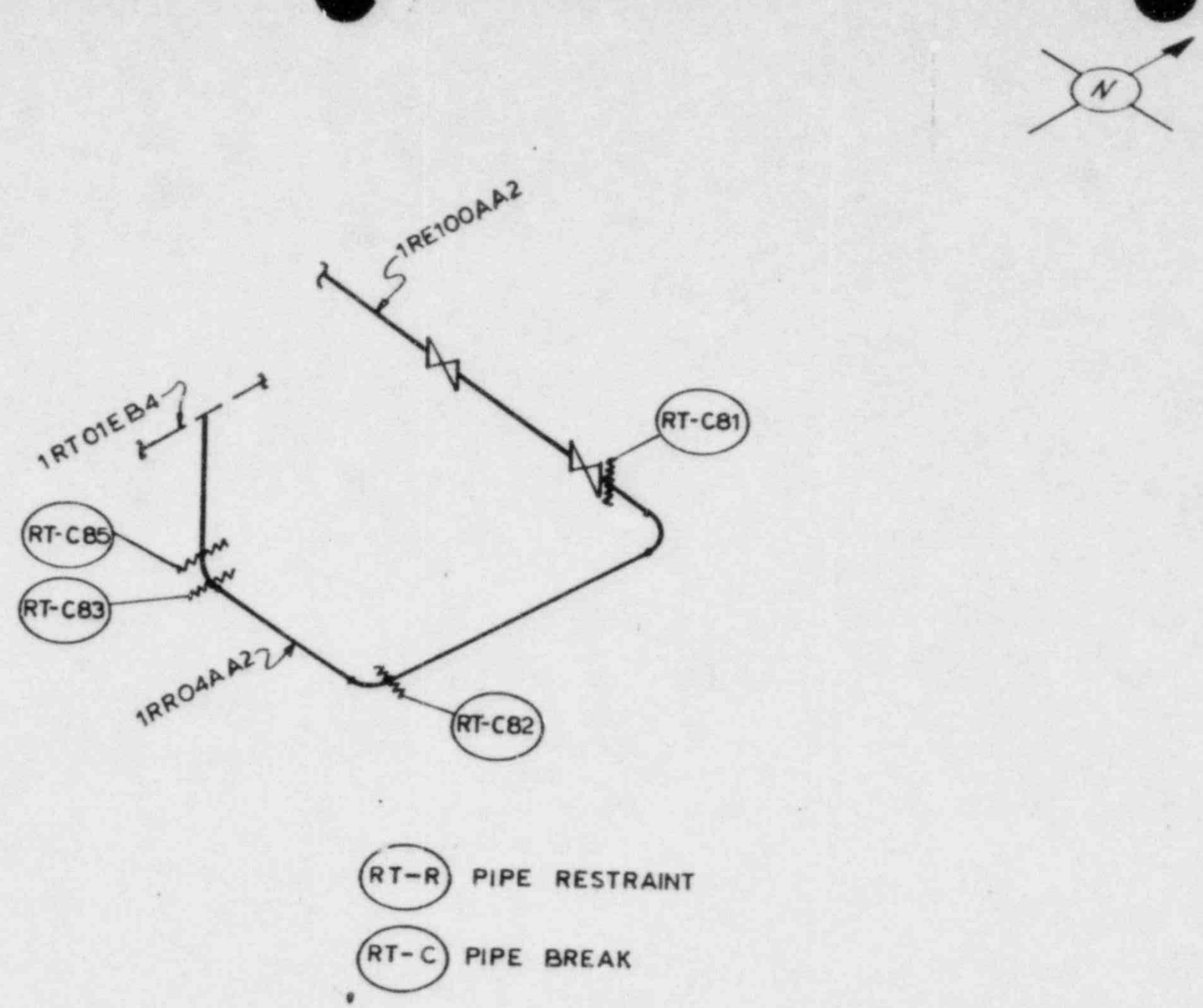
LOCATION OF POSTULATED BREAKS
RCIC HEAD SPRAY PIPING
INSIDE CONTAINMENT
(SHEET 1 OF 2)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-25

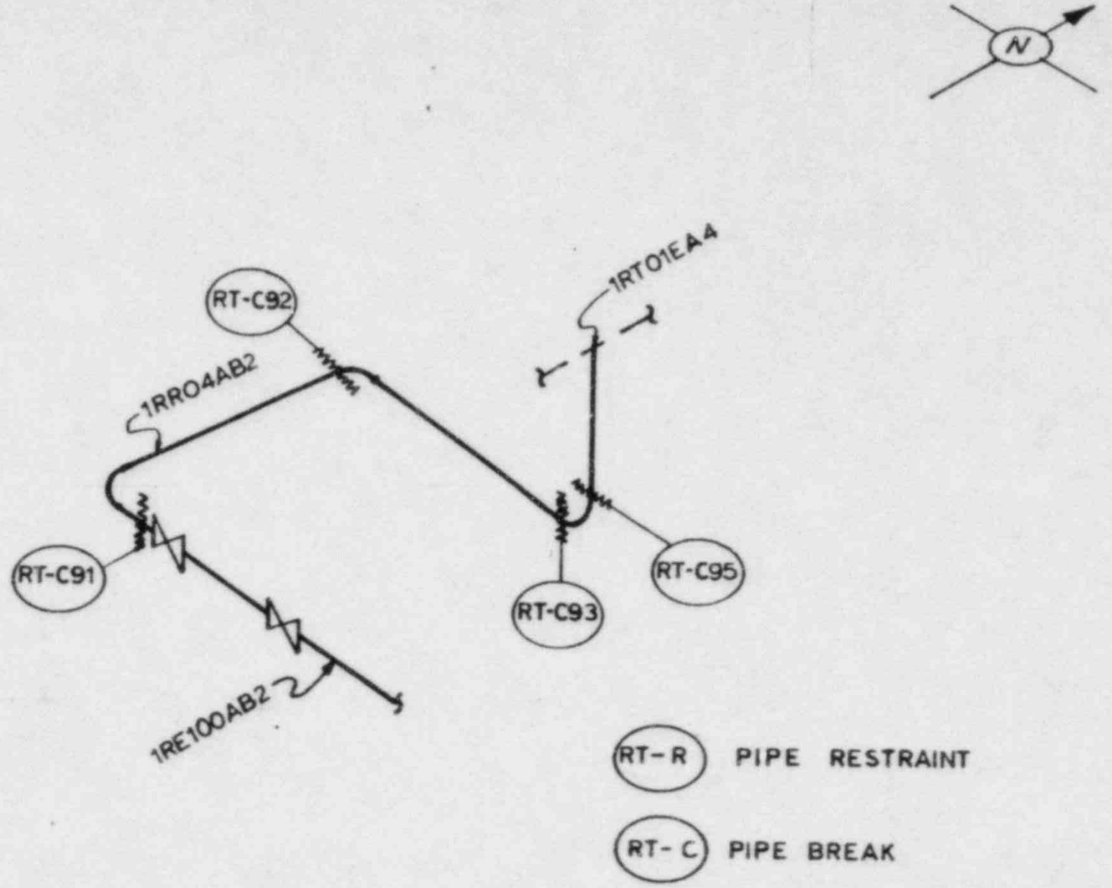
LOCATION OF POSTULATED BREAKS
RCIC HEAD SPRAY PIPING
INSIDE CONTAINMENT
(SHEET 2 OF 2)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-26

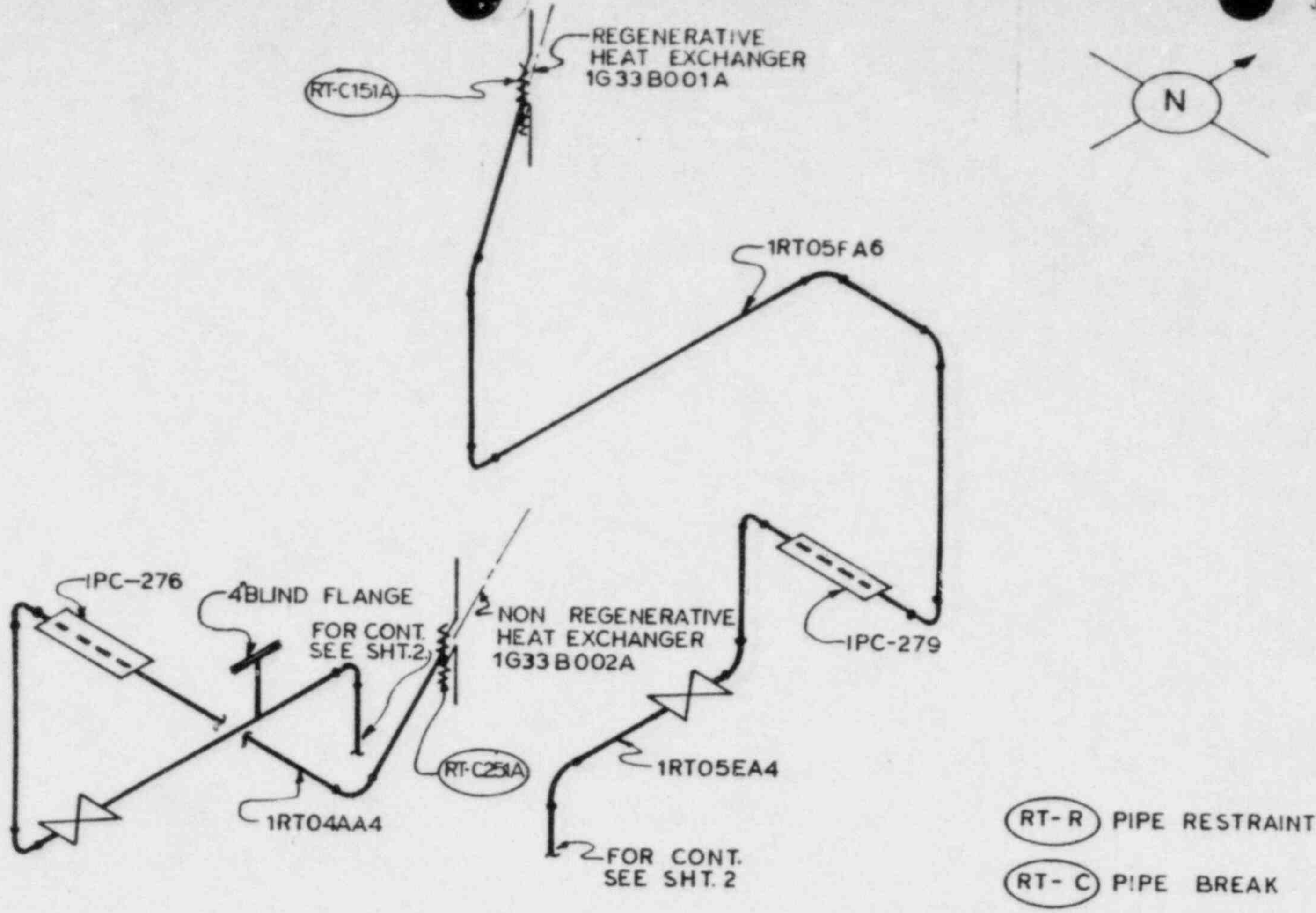
LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP DRAIN LINE
PIPING INSIDE CONTAINMENT
(SHEET 1 OF 2)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-26

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP DRAIN LINE
PIPING INSIDE CONTAINMENT
(SHEET 2 OF 2)

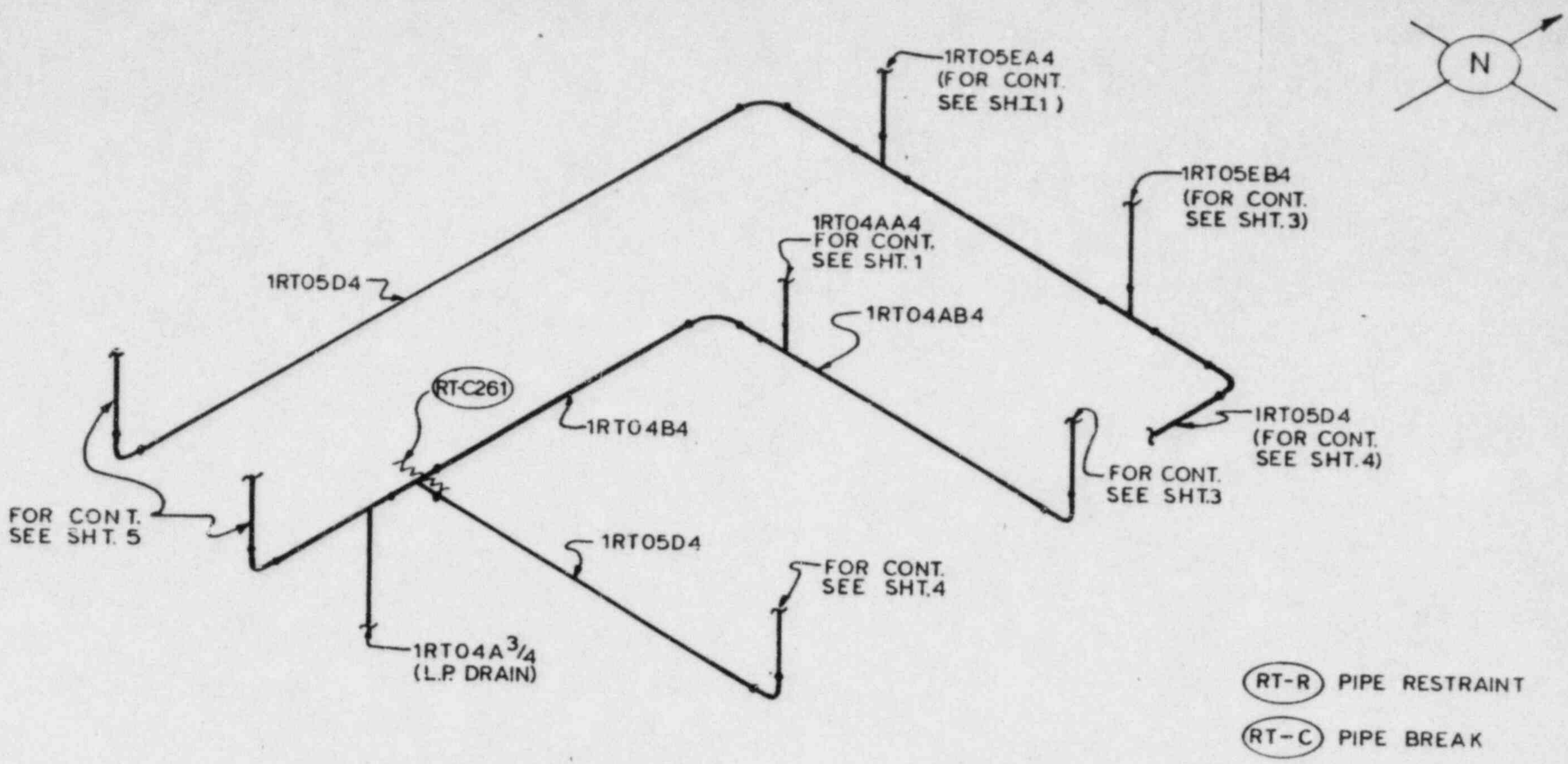


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-27

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT

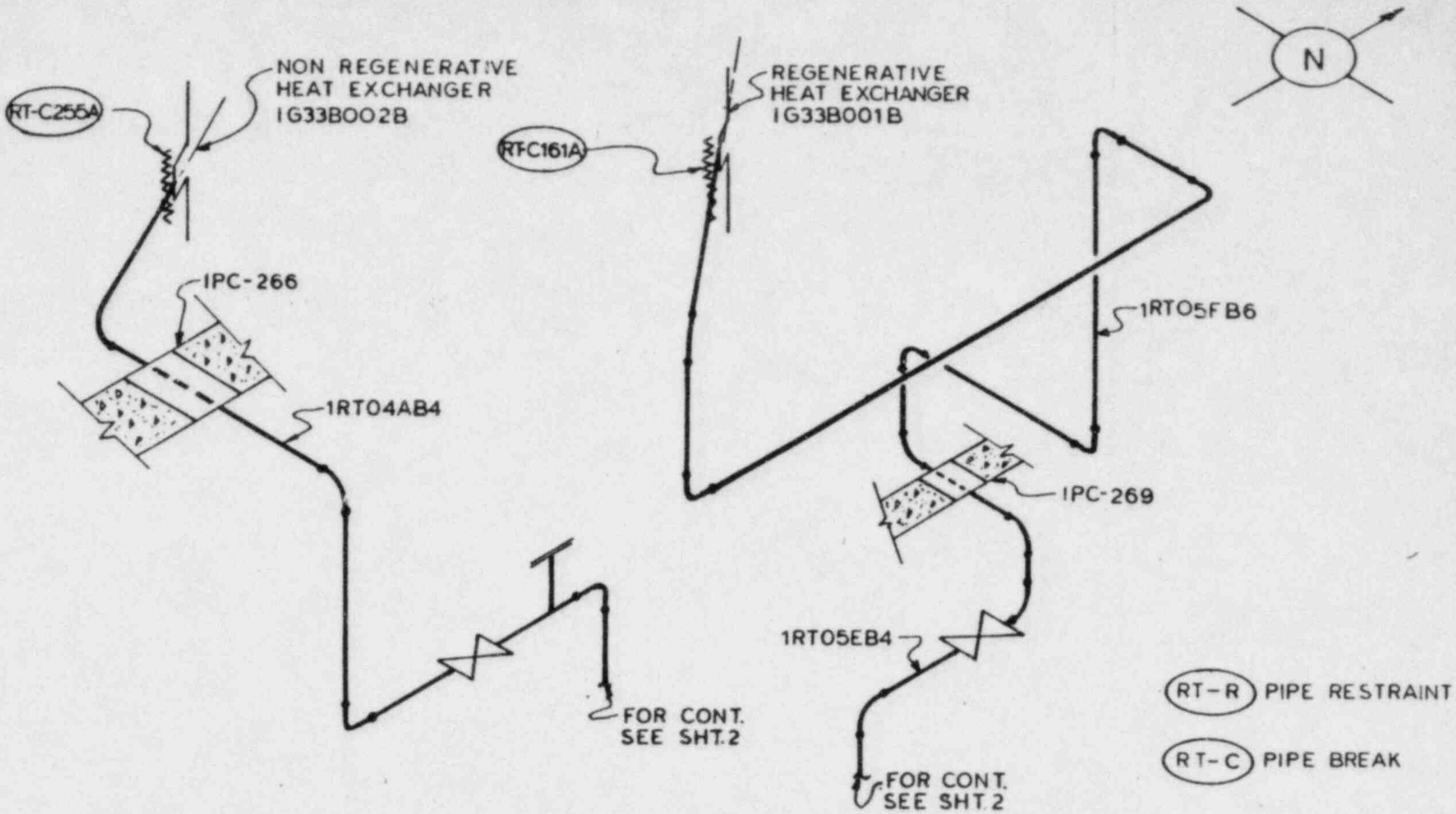
(SHEET 1 OF 8)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-27

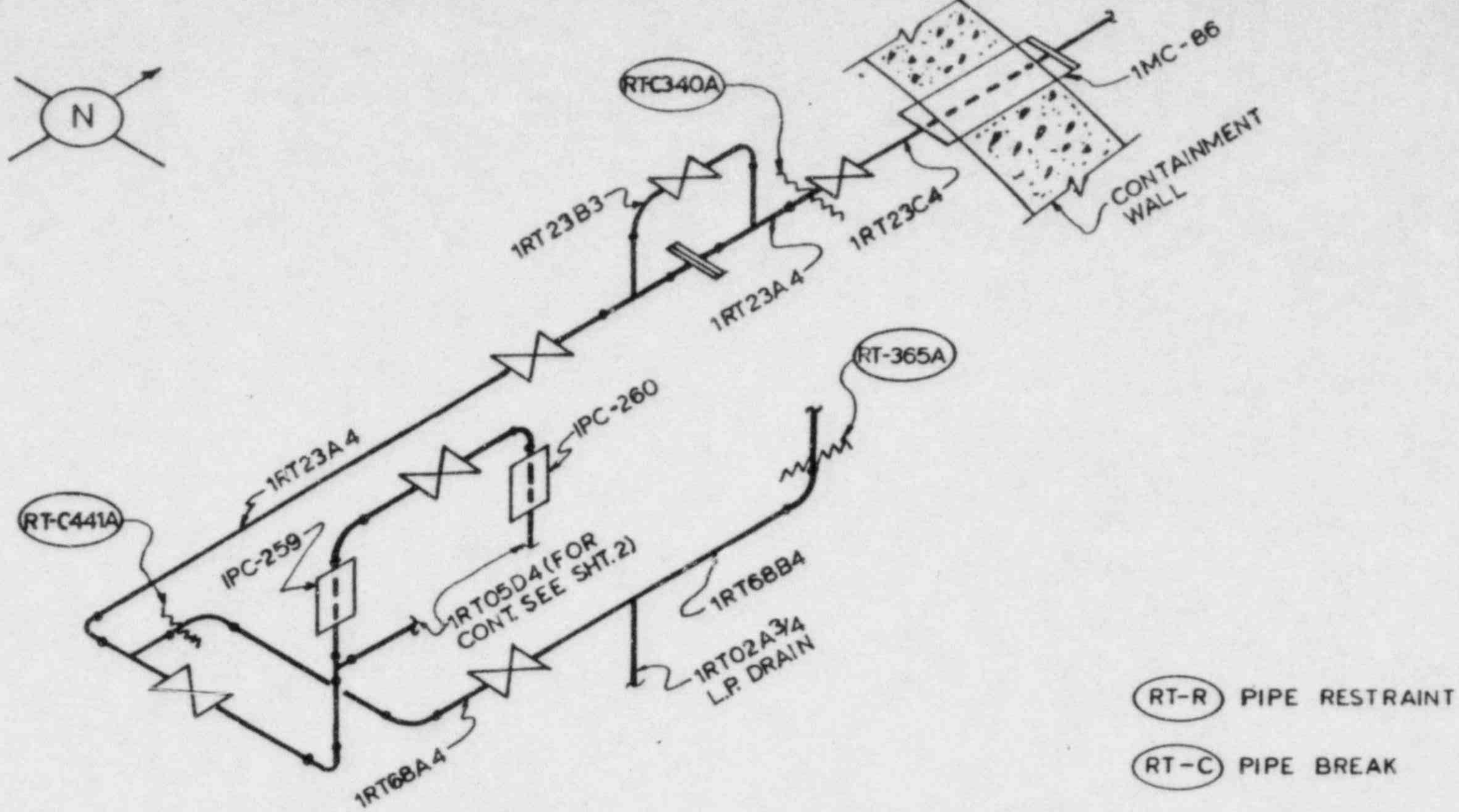
LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT
(SHEET 2 OF 8)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-27

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT
(SHEET 3 OF 8)

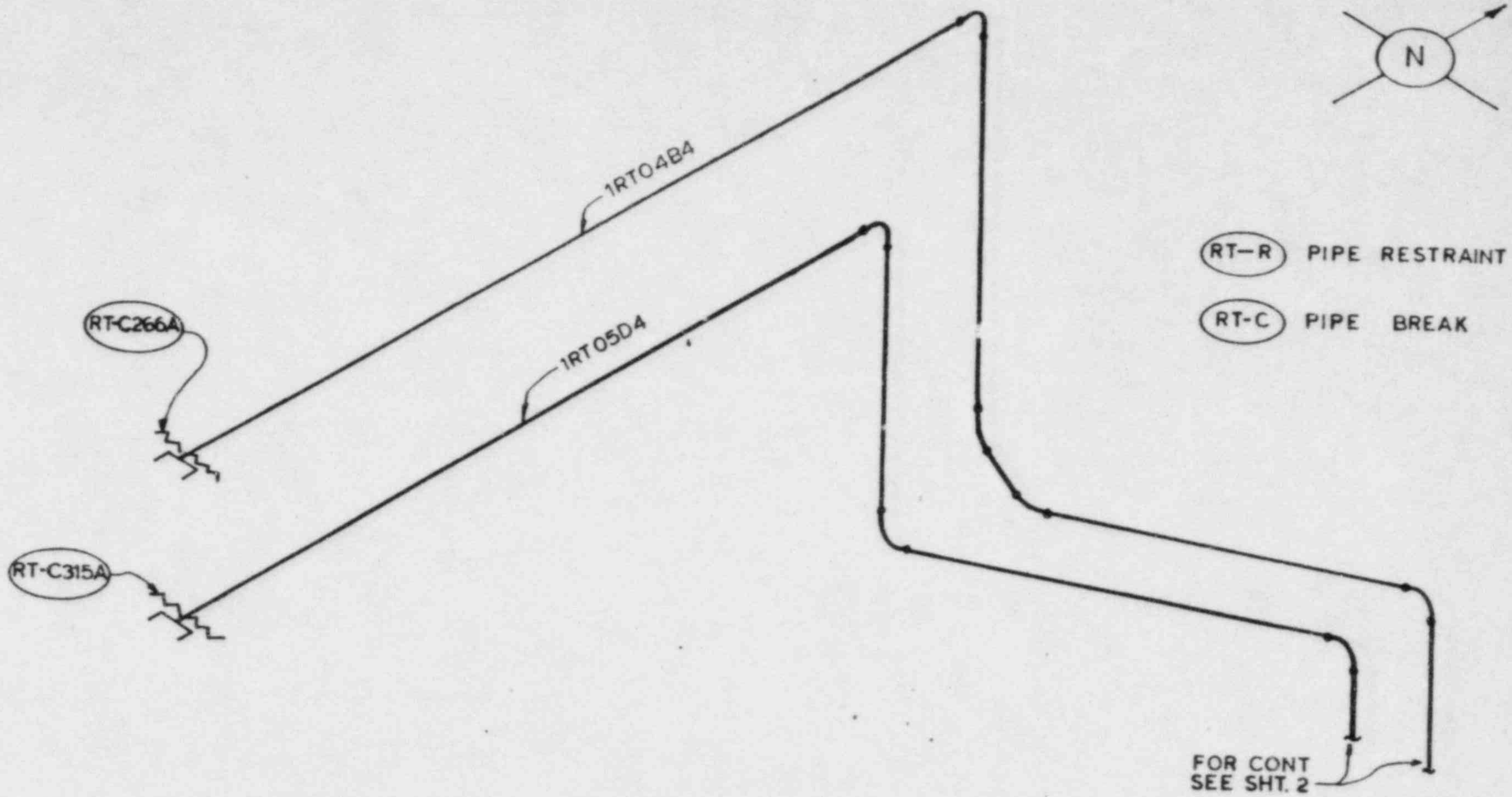


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-27

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT
(SHEET 4 OF 8)

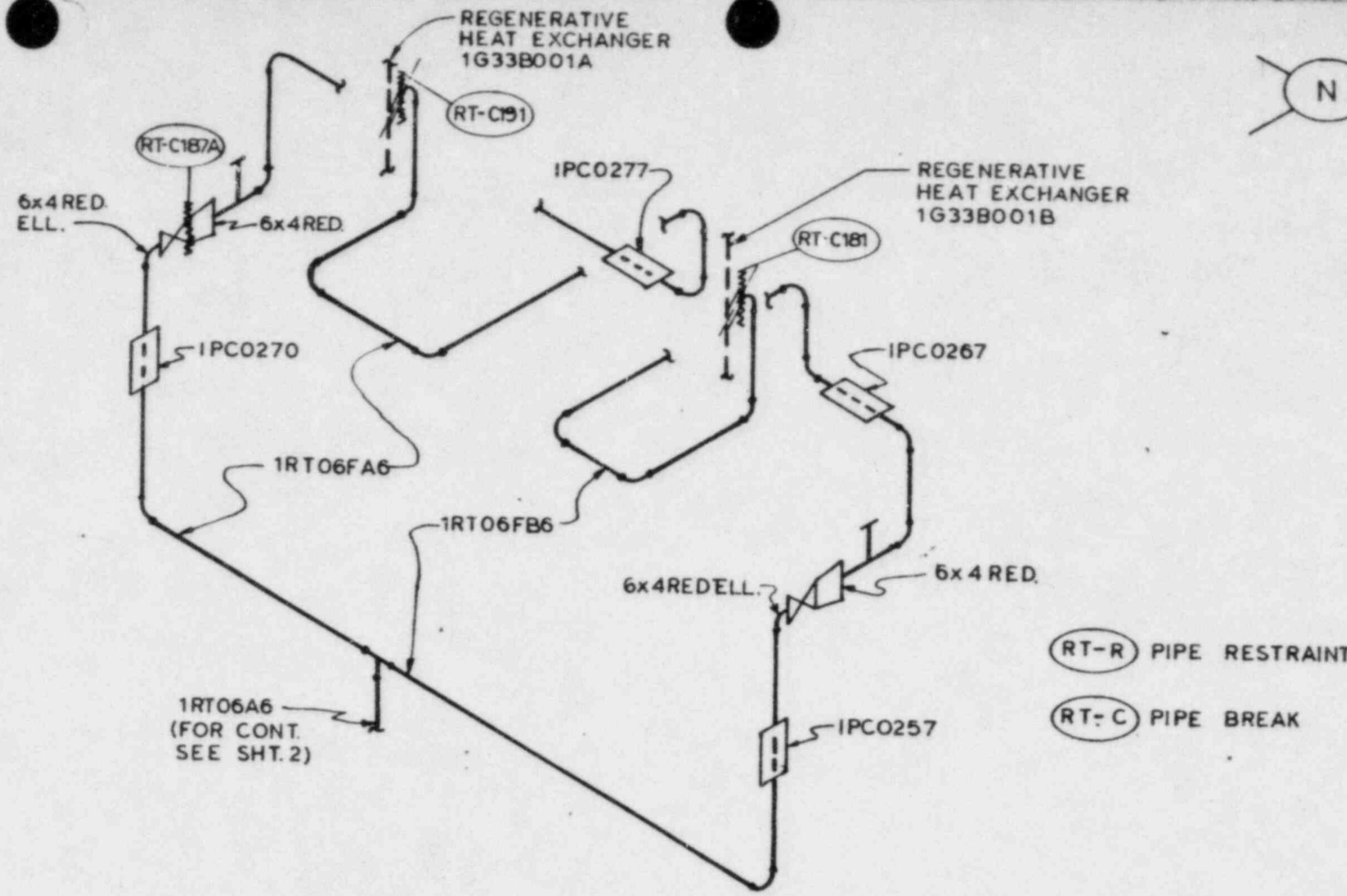
AMENDMENT 34
JULY 1985



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

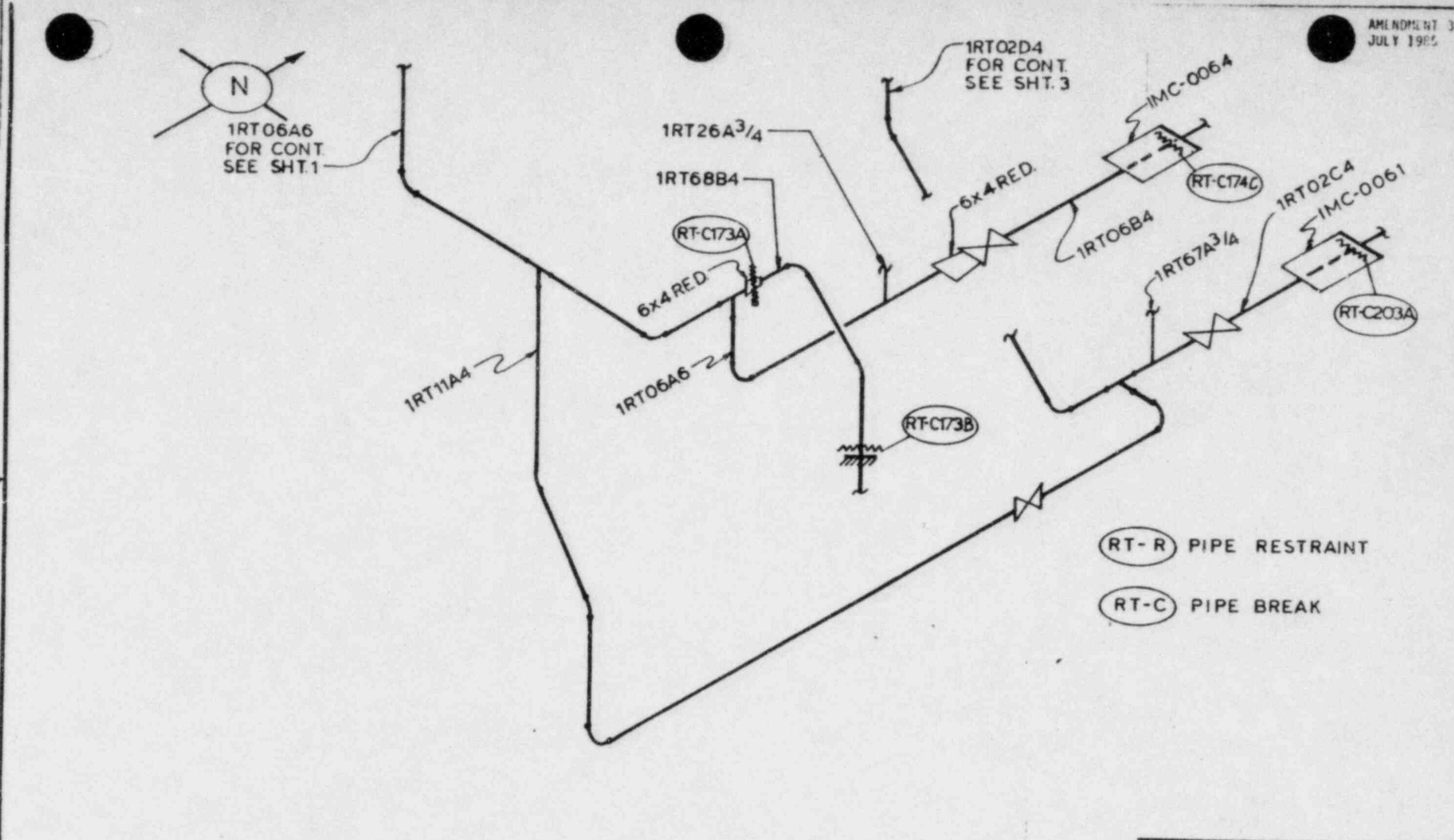
FIGURE B3.6-27

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT
(SHEET 5 OF 8)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

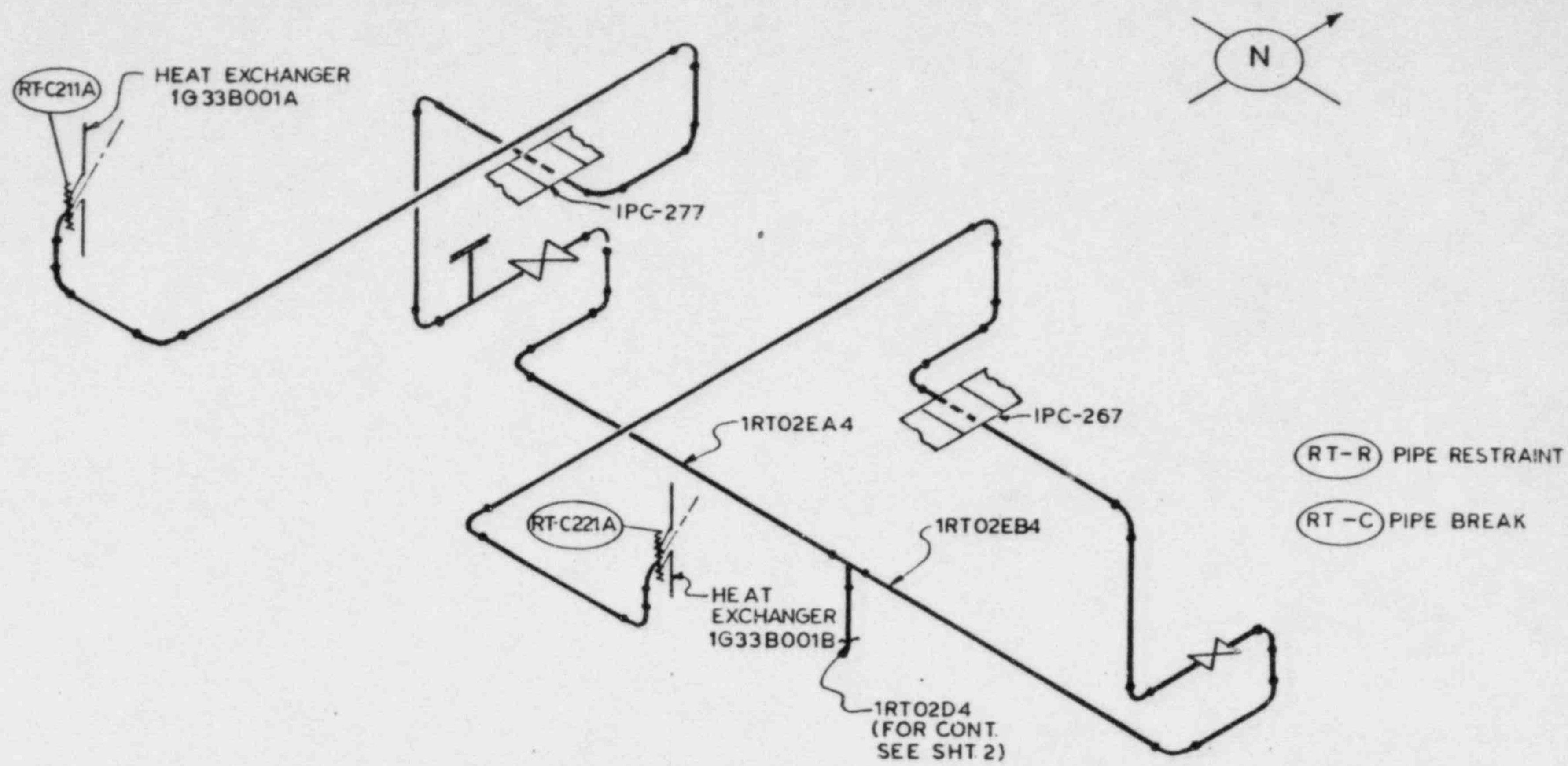
FIGURE B3.6-27
LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT
(SHEET 6 OF 8)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-27

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT
(SHEET 7 OF 8)

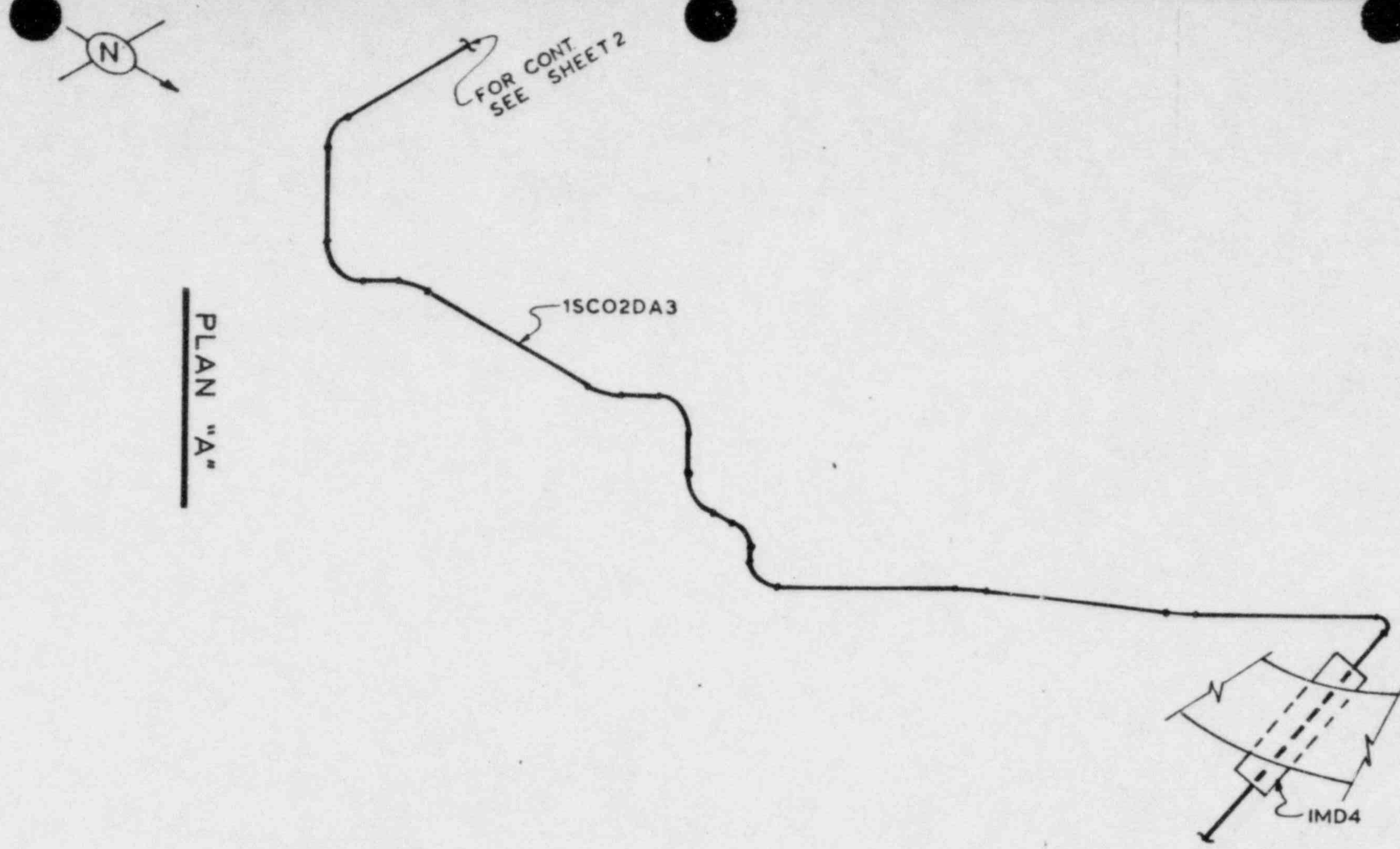


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-27

LOCATION OF POSTULATED BREAKS
REACTOR WATER CLEAN UP
PIPING INSIDE CONTAINMENT

(SHEET 8 OF 8)

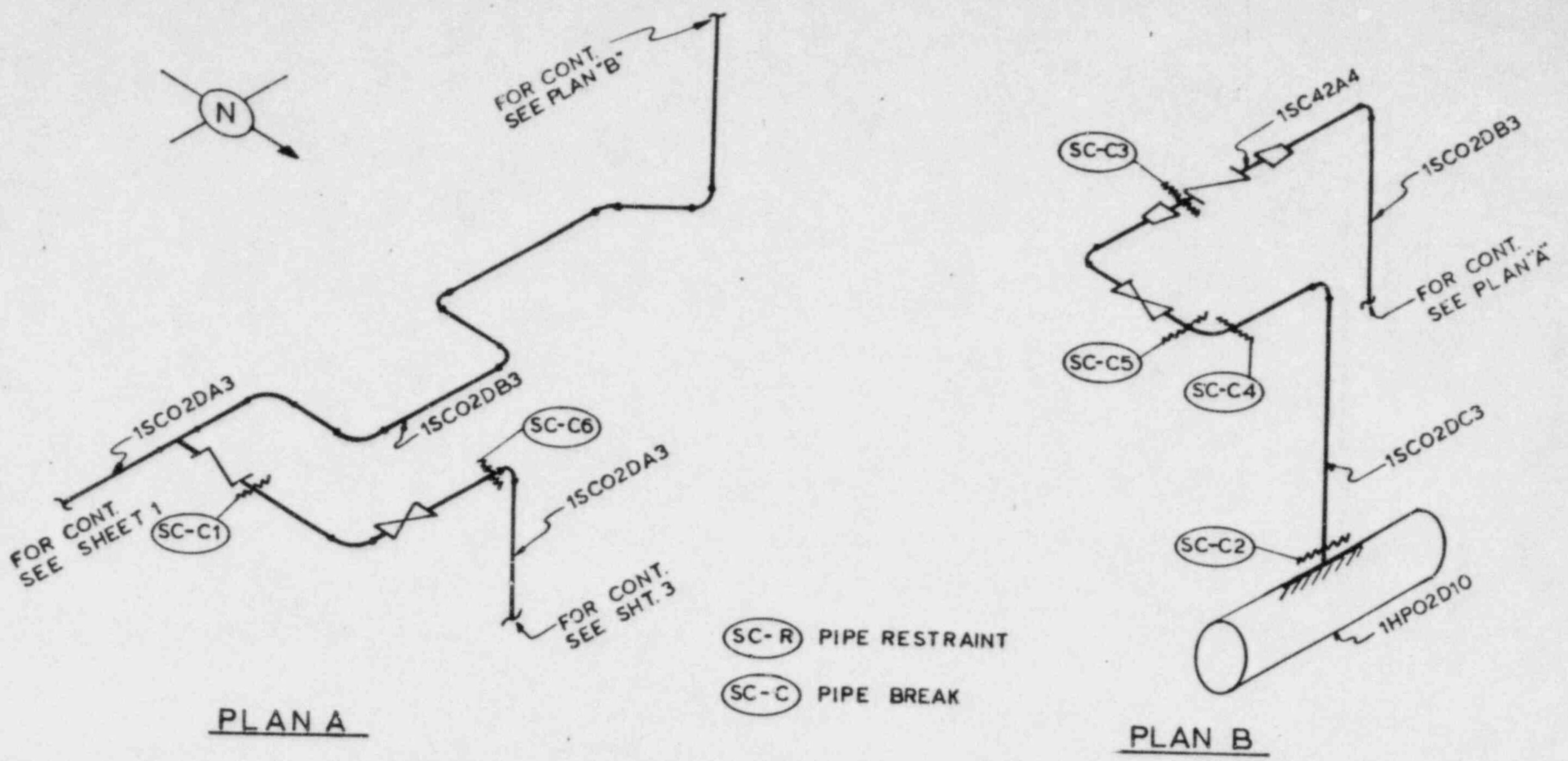


CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-28

LOCATION OF POSTULATED BREAKS
STANDBY LIQUID CONTROL PIPING
INSIDE CONTAINMENT

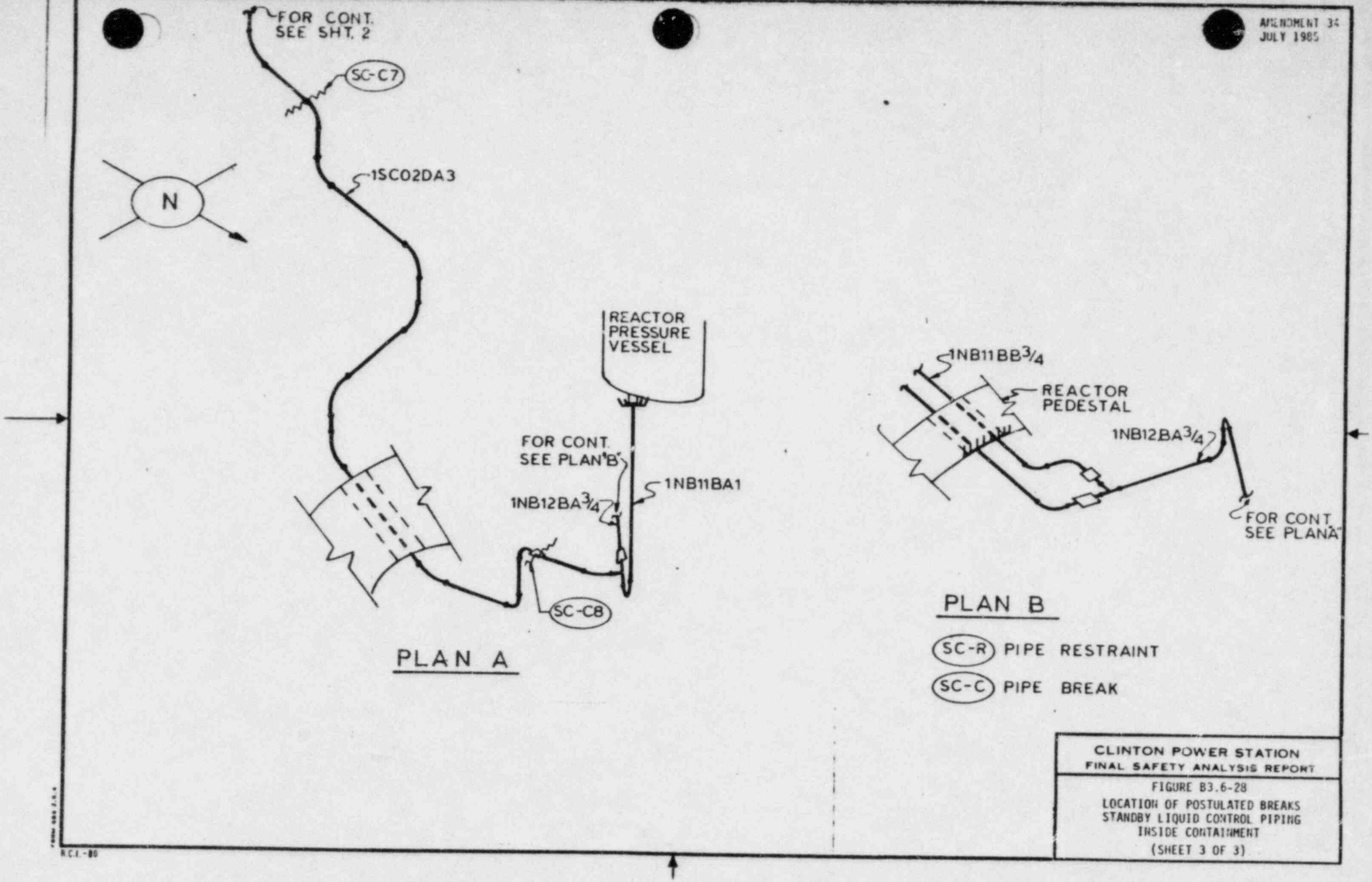
(SHEET 1 OF 3)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-28

LOCATION OF POSTULATED BREAKS
STANDBY LIQUID CONTROL PIPING
INSIDE CONTAINMENT
(SHEET 2 OF 3)



CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE B3.6-28

LOCATION OF POSTULATED BREAKS
STANDBY LIQUID CONTROL PIPING
INSIDE CONTAINMENT

(SHEET 3 OF 3)

TABLE 3.7-12

CIRCULATING WATER SCREEN HOUSE MODEL FOR HORIZONTAL EXCITATION - MODAL FREQUENCIES AND PARTICIPATION FACTORS

MODE	FREQUENCY (Hertz)	PARTICIPATION FACTORS N-S EXCITATION	E-W EXCITATION
1	10.94	48.50	0.02
2	17.88	-0.03	50.53
3	20.41	8.85	-0.03
4	24.24	-11.13	-0.11
5	31.88	0.43	-7.90
6	36.91	4.38	0.68
7	38.72	-3.94	0.19
8	40.36	1.14	1.45
9	56.19	-5.24	0.14

The CWSH is also designed for the hydrostatic and hydrodynamic effects of the cooling lake water.

The pools in the fuel building are designed for, in addition to applicable loads listed above, hydrostatic loads and hydrodynamic loads associated with water set in motion by seismic accelerations. The pools are designed for the effects of a maximum water temperature of 212° F.

The containment gas control boundary is designed to be held under a negative pressure equivalent to 1/4 inch of water when inflitration flow rates given in Subsection 6.2.3 are being passed through the standby gas treatment system. The containment gas control boundary is not designed to withstand the effects of missiles. The siding of the enclosure is assumed to fail under tornado loading. The gas control boundary is a fission product barrier only, and it is not designed for the high remperatures and pressures which are postulated for the containment. The steel framing for the containment gas control boundary is designed to withstand effects of tornado loading.

In all instances, the Seismic Category I structures and structural components are designed for the vertical and horizontal accelerations associated with both SSE and OBE.

In Radwaste, Control and Diesel Generator Buildings, the effects of pool dynamic loads associated with SRV actuation and LOCA are considered negligible and shall not be used for the analysis and design of these buildings.

3.8.4.4 <u>Design and Analysis Procedures</u>

Conventional elastic techniques are used in the design and analysis of all structural components. All buildings are analyzed basically as shear wall structures, and all significant openings and discontinuities in structural members are included in the structural model. The boundary conditions selected for all structural models are determined by evaluating the stiffnesses (flexural, torsional and axial) of all the members connected to a boundary point and represent, to the extent practical, the actual restraint conditions.

The walls, interacting with the floor slabs, are proportioned to resist the combination of seismic-induced overturning moments, vertical loads, and shears in accordance with the special provisions for shear walls of Appendix A.8 of ACI 318. Adequate provisions are made to transfer wall moments, vertical loads, and shears to the foundation.

The finite element program SLSAP is used to analyze the basemat and the fuel pool walls. Frame analysis is done using computer program STRUDL-II. Concrete beams and columns are designed using the computer programs CBEAM and PCAUC respectively. The STAND system is used to analyze and design structural steel beams and columns. For design of plate girders, the computer program PLGIRD is used.

Limitation of concrete strain is per ACI 318 for both operating and design-basis loads for all structures, except for structures

term loads. Values below the lower value specified are checked to assure that the assumed values yield maximum stresses.

Structural building supports for rotating or reciprocating (vibratory) Seismic Category I equipment satisfy vibratory design requirements. The equipment foundation design for vibratory equipment satisfies the machine vibration tolerances given in Figure 4 of "Vibration Tolerances" by T. C. Rathbone, Power Plant Engineering, Vol. 43, 1939. This has been accomplished by providing a foundation-equipment mass ratio of 2.5 for vibratory equipment which weighs less than 5 kip and by performing appropriate dynamic analyses for vibratory equipment which weighs 5 kip or more.

3.8.5.5 Structural Acceptance Criteria

3.8.5.5.1 Structural Member Design

The acceptance criteria for the reactor containment base slab are as specified in Subsection3.8.1.5.

The foundations for the main building complex and other Seismic Category I structures are proportioned according to the criteria set forth in Subsection 3.8.4.5.

3.8.5.5.2 Stability

As described in Subsection 3.8.5.4 the basemats are supported on elastic soil springs and overturning is resisted by unequal bearing pressure.

Table 3.8-1.3 lists the loads, load combinations, and factors of safety considered in the foundation stability investigation.

3.8.5.6 Materials, Quality Control, and Special Construction Techniques

The construction materials for the mat foundations, concrete supports and machinery and equipment anchors conform to the standards set forth in Appendix B. Contained in that appendix is a discussion of the quality control procedures adopted which include the frequency and location of sampling and test requirements for the materils. Cadwelding is described in detail.

3.8.5.7 Testing and Inservice Surveillance Techniques

Routine observations are made of the mat foundations and concrete supports to determine the extent of cracking and settlement. Representative equipment anchor bolts are periodically tested for tightness.

Rigorous inspection during construction in conjunction with the quality control procedures for the structural materials outlined in Appendix B is carried out. Structural integrity and/or

3.8.5.7 Testing and Inservice Surveillance Techniques

Routine observations are made of the mat foundations and concrete supports to determine the extent of cracking and settlement. Representative equipment anchor bolts are periodically tested for tightness.

Rigorous inspection during construction in conjunction with the quality control procedures for the structural materials outlined in Appendix B is carried out. Structural integrity and/or

TABLE 3.8-1.2

LOAD COMBINATION AND LOAD FACTORS FOR REINFORCED CONCRETE

(STRUCTURES OTHER THAN CONTAINMENT)

LOADING COMBINATION		LOAD FACTORS																									
			L																		*SRV (h)			*LOCA (h)			
DESCRIPTION	NO.	D	EHL	SLL	C	R_o	P_o	T_o	E	E'	W (a)	W_t	R_a	P_a	T_a	H'	M	Yr	Yj	Ym	ADS	1VLP	ALL	CH	CO	PS	MV	Design Strength
CONSTRUCTION	1	1.3	1.3		1.3			1.3			1.3																	ACI 318-71
	2	1.4	1.4		1.7			1.7																				ACI 318-71
TEST	3	1.1	1.3		1.3	1.3	1.3	1.3																				ACI 318-71
NORMAL	4	1.4	1.7		1.7	1.7	1.7	1.7																				ACI 318-71
	5	1.4		1.7	1.7	1.7	1.7	1.7														1.7	1.7					ACI 318-71
SEVERE ENVIRONMENTAL	6	1.4	1.7		1.7	1.7	1.7	1.7			1.7																	ACI 318-71
	7	1.4		1.7	1.7	1.7	1.7	1.7			1.7											1.7	1.7					ACI 318-71
	8	1.2				1.7	1.7	1.7			1.7											1.7	1.7					ACI 318-71
	9	1.4		1.7	1.7	1.7	1.7	1.7	1.9													1.7	1.7					ACI 318-71
	10	1.2				1.7	1.7	1.7	1.9													1.7	1.7					ACI 318-71
ABNORMAL	11	1.0		1.0	1.0								1.0	1.5	1.0							1.25		1.0	1.0	1.0	1.0	ACI 318-71
	12	1.0		1.0	1.0								1.0	1.5	1.0						1.25			1.0	1.0			ACI 318-71
	13	1.0		1.0	1.0	1.0	1.0	1.0									1.0					1.0	1.0					ACI 318-71
EXTREME ENVIRONMENTAL	14	1.0		1.0	1.0	1.0	1.0	1.0		1.0												1.0	1.0					ACI 318-71
	15	1.0		1.0	1.0	1.0	1.0	1.0				1.0										1.0	1.0					ACI 318-71
	16	1.0		1.0	1.0	1.0	1.0	1.0								1.0						1.0	1.0					ACI 318-71
ABNORMAL/ SEVERE	17	1.0		1.0	1.0				1.25				1.0	1.25	1.0			1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	ACI 318-71
	18	1.0		1.0	1.0				1.25				1.0	1.25	1.0			1.0	1.0	1.0	1.0			1.0	1.0			ACI 318-71
ABNORMAL/ EXTREME	19	1.0		1.0	1.0					1.0			1.0	1.0	1.0			1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	ACI 318-71
	20	1.0		1.0	1.0					1.0			1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0			ACI 318-71

NOTES:

a) For construction combination, wind load for a 10-year recurrence interval shall be used.
b) Ta is based on a temperature corresponding to the pressure, Pa.
c) Loads not applicable to a particular system may be deleted.
d) If for any load combination, the effect of any load other than D reduces the load, it will be deleted from the combination.
e) For E, E', Wt, M & ra, the resultant effects for both horizontal and vertical force components shall be determined by combining the individual effects by the square root of the sum of the squares.
f) For combinations 13, 17, 18, 19 and 20 local stresses due to concentrated loads Yr, Yj, Ym & M may exceed allowable stresses provided that there will be no loss of function of any safety related system.
g) For loading combinations 1 through 10, the load factors shown shall be applied using zero values for Ro and To. These load combinations shall also be checked using the values for Ro and To, but multiplying the combination by 0.75.
h) SRV and LOCA loads are considered negligible in the radwaste, control and diesel generator buildings, and shall not be used in the analysis and design of these buildings.
* Only one load under each of these loadings shall be considered at one time.

TABLE 3.8-1.3

LOAD COMBINATIONS FOR STRUCTURAL STABILITY OF FOUNDATIONS

LOADING COMBINATION		LOAD FACTORS																SAFETY FACTORS		
											SRV (Notes 3,5)			LOCA (Notes 3,5)						
DESCRIPTION	NO.	D_s	D_e	D_l	L_l	E	E'	W	W_t	H'	IV 2P	ADS	ALL	MVC	PS	CO	CH	OVERTURNING	SLIDING	FLOTATION
SEVERE	1	1.0	1.0	1.0	1.0			1.0			1.0		1.0					1.5	1.5	1.5
ENVIRONMENTAL	2	1.0	1.0	1.0	1.0	1.0					1.0		1.0							
EXTREME	3	1.0	1.0	1.0	1.0				1.0		1.0		1.0							
ENVIRONMENTAL	4	1.0	1.0		1.0					1.0	1.0		1.0					1.1	1.1	1.1
	4a	1.0	1.0	1.0	1.0		1.0				1.0		1.0							
ABNORMAL	5	1.0	1.0	1.0	1.0	1.0					1.0			1.0	1.0	1.0	1.0	1.1	1.1	1.1
SEVERE	5a	1.0	1.0	1.0	1.0	1.0						1.0				1.0	1.0			
ABNORMAL	6	1.0	1.0	1.0	1.0		1.0				1.0			1.0	1.0	1.0	1.0	1.1	1.1	1.1
EXTREME	7	1.0	1.0	1.0	1.0		1.0					1.0				1.0	1.0			

NOTES:

1. D_s = Self Weight of Structure
   D_l = Vertical and Lateral Pressure of Liquid, Groundwater, and Vertical Soil Pressure
   D_e = Actual equipment loads from manufacturers' drawings
   L_l = Lateral soil pressure

2. If for any load combination, the effect of any load other than the dead load reduces the load, it will be deleted from the combination.

3. Only one load under each of these loadings shall be considered at one time.

4. For definition of load combinations and loads not defined in Note 1, refer to Table 3.8-1.2.

5. SRV and LOCA loads are considered negligible in the radwaste, control and diesel generator buildings, and shall not be used in the analysis and design of these buildings.

AMENDMENT 34
JULY 1985

TABLE 3.8-2

LOAD COMBINATIONS FOR STRUCTURAL STEEL

		LOAD FACTORS																											
			L																			SRV (g)(j)			LOCA (g)(i)(j)				ALLOWABLE
DESCRIPTION	NO.	D	EHL	SLL	S	C	R_o	P_o	T_o	E	E'	W	W_t	R_a	P_a	T_a	H'	M	Y_r	Y_j	Y_m	ADS	1V2P	ALLV	CH	CO	PS	MVC	STRESS
Construction	1	1.0	1.0			1.0			1.0			1.0																	1.33 AISC
	2	1.0	1.0		1.0	1.0			1.0																				AISC
Test	3	1.0	1.0		1.0	1.0	1.0	1.0	1.0																				1.33 AISC
Normal	4	1.0	1.0		1.0	1.0	1.0	1.0	1.0																				AISC
	5	1.0		1.0	1.0	1.0	1.0	1.0	1.0														1.0	1.0					AISC
Severe Environmental	6	1.0		1.0		1.0	1.0	1.0	1.0	1.0													1.0	1.0					AISC
	7	1.0	1.0			1.0	1.0	1.0	1.0			1.0																	AISC
	8	1.0		1.0		1.0	1.0	1.0	1.0			1.0											1.0	1.0					AISC
Abnormal	9	1.0		1.0	1.0	1.0								1.0	1.0	1.0							1.0		1.0	1.0	1.0	1.0	1.6 AISC≤ .95 Fy
	10	1.0		1.0	1.0	1.0								1.0	1.0	1.0						1.0			1.0	1.0			1.6 AISC≤ .95 Fy
	11	1.0		1.0	1.0	1.0	1.0	1.0	1.0									1.0					1.0	1.0					1.6 AISC≤ .95 Fy
Extreme Environmental	12	1.0		1.0		1.0	1.0	1.0	1.0		1.0												1.0	1.0					1.6 AISC≤ .95 Fy
	13	1.0		1.0			1.0	1.0	1.0				1.0										1.0	1.0					1.6 AISC≤ .95 Fy
	14	1.0		1.0		1.0	1.0	1.0	1.0								1.0						1.0	1.0					1.6 AISC≤ .95 Fy
Abnormal/ Severe	15	1.0		1.0		1.0				1.0				1.0	1.0	1.0			1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	1.6 AISC≤ .95 Fy
	16	1.0		1.0		1.0				1.0				1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0			1.6 AISC≤ .95 Fy
Abnormal/ Extreme	17	1.0		1.0		1.0					1.0			1.0	1.0	1.0			1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	1.6 AISC≤ .95 Fy
	18	1.0		1.0		1.0					1.0			1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0			1.6 AISC≤ .95 Fy

NOTES:

a) For construction combination, wind load for a 10-year recurrence interval shall be used.
b) T_a is based on a temperature corresponding to the pressure, P_a.
c) Loads not applicable to a particular system may be deleted.
d) If for any load combination, the effect of any load other than D reduces the load, it will be deleted from the combination.
e) For E, E', W_t, M & R_a, the resultant effects for both horizontal and vertical force components shall be determined by combining the individual effects by the square root of the sum of the squares.
f) For loading combinations 2, 4, 5, 6, 7 and 8 use zero values for R_o and T_o with AISC allowables. These combinations shall also be checked using the values of R_o and T_o but the AISC allowables shall be increased by 33%.
g) Only one load under each of these loadings shall be considered at one time.
h) For load categories and load definitions refer to Table 3.8-1.
S - Stability loads. Stability loads are psuedo-static loads applied to a braced steel frame to assure sufficient strength and stiffness for column, beam, and girder stability.
i) The loads due to a pool swell event are applied on the structural steel as pseudo static loads with dynamic load factors consistent with ductility ratios given in Standard Review Plan Section 3.5.3.
j) SRV and LOCA loads are considered negligible in the radwaste, control and diesel generator buildings, and shall not be used in the analysis and design of these buildings.

3.9.2.2 Seismic Qualification of Safety-Related Mechanical Equipment

3.9.2.2.1 Seismic and Hydrodynamic Qualification of Safety-Related NSSS Mechanical Equipment

This subsection describes the criteria for dynamic load qualification of safety-related mechanical equipment and also describes the qualification testing and/or analysis applicable to this plant for all the major components on a component by component basis. In some cases, a module or assembly consisting of mechanical and electrical equipment is qualified as a unit, for example, motor powered pumps. These modules are generally discussed in this paragraph rather than providing discussion of the separate electrical parts in Subsections 3.10 and 3.11. Dynamic qualification testing is also discussed in Subsection 3.9.3.2. Electrical supporting equipment such as control consoles, cabinets, and panels which are part of the NSSS are discussed in Subsection 3.10.

3.9.2.2.1.1 Tests and Analysis Criteria and Methods

The ability of equipment to perform its safety-related function during and after the application of dynamic loads is demonstrated by tests and/or analysis. Selection of testing, analysis or a combination of the two is determined by the type, size, shape, and complexity of the equipment being considered. When practical, equipment operability is demonstrated by test. Otherwise, it is demonstrated by mathematical analysis.

Equipment which is large, simple, and/or consumes large amounts of power is usually qualified by analysis or test to show that the loads, stresses and deflections are less than the allowable maximum. Analysis and/or testing is also used to show there are no natural frequencies below 33 Hz for seismic load and 60 Hz for hydrodynamic loads. If a lower natural frequency is determined, dynamic tests and/or analyses are performed to verify operability and structural integrity for the required dynamic input conditions.

When the equipment is qualified by dynamic test, the response spectrum or time history of the attachment point is used in determining input motion.

Natural frequency may be determined by running a continuous sweep frequency search using a sinusoidal steady state input of low magnitude. Dynamic load conditions are simulated by testing using random vibration input or single frequency input (within

3.9.3.2.2.1 Pumps

All active pumps are tabulated in Table 3.9-5 and are qualified for operability by first being subjected to tests both prior to installation in the plant and after installation in the plant. The in-shop tests include (1) hydrostatic tests of pressure-retaining parts to 1.25 times the system design pressure for ASME Class 1 pumps and 1.5 times the system design pressure for ASME Class 2 and 3 pumps; and (2) performance tests, while the pump is under operation, to determine total developed head, minimum and maximum head, net positive suction head (NPSH) requirements, and other pump/motor parameters. After the pump is installed in the plant, it undergoes the cold hydro tests, functional tests, and the required periodic inservice inspection and operation. These tests demonstrate reliability of the pump for the design life of the plant.

3.9.3.2.2.1.1 Seismic Analysis of Pumps

In addition to the required testing, the pumps are designed and supplied in accordance with the following specified criteria:

a. In order to ensure that the active pump will not be damaged during the seismic event, the pump manufacturer is required to demonstrate by test or analysis that the lowest natural frequency of the pump is greater than 33 hertz. The pump, when having a natural frequency above 33 hertz, will be considered essentially rigid. This frequency is considered sufficiently high to avoid problems with amplification between the component and structure for all seismic areas. The natural frequency of the

support is determined and used in conjunction with the applicable relevant seismic response spectra.

In addition, a static shaft deflection analysis of the rotor is performed. The deflection determined from the static shaft analysis is compared to the allowable rotor clearances.

In case the natural frequency is found to be below 33 hertz, a dynamic or pseudodynamic analysis is performed to determine the amplified input accelerations necessary to perform the stress analysis. In addition, a static deflection analysis is performed as discussed earlier.

b. Nozzle loads from interconnecting piping systems are considered in the stress analysis of the pumps and their supports.

c. To complete the seismic qualification procedures, the pump motor and all appurtenances vital to the operation of the pump are independently qualified for operation during the maximum seismic event in accordance with IEEE 344 (see Section 3.10). In the analysis, interaction between the pump and motor is considered.

From this, it is concluded that the nuclear safety-related pump/motor assemblies will not be damaged and will continue operating under SSE loadings and will perform their intended functions. These requirements take into account the complex characteristics of the pump and are sufficient to demonstrate and assure the seismic operability of the active pumps.

3.9.3.2.2.2 Valves

Safety-related active valves are tabulated in Table 3.9-5 and must perform their mechanical motion in times of an accident. Assurance that these valves will operate during a seismic event is obtained by qualification tests and/or analyses for all active valves.

The safety-related valves are subjected to a series of stringent tests prior to service and during plant life. Prior to installation, the following tests are performed: a shell hydrostatic test according to ASME Section III code requirements; backseat and main seat leakage tests; disc hydrostatic test; functional tests to verify that the valve will open and close within the specified time limits when subjected to the design pressure; and an operability qualification of valve actuators for the environmental conditions over the installed life of the valve.

Cold hydro qualification tests, functional qualification tests, and periodic inservice inspections are performed to verify and ensure the functional ability to the valve. These tests and appropriate maintenance ensure operability of the valve for the design life of the plant. The valves are designed using either the standard or the alternate design rules of ASME Section III. On all active valves, an analysis of the extended structure is also performed for static equivalent seismic loads applied at the center of gravity of the extended structure. The maximum stresses and deflections allowed in these analyses show adequate structural integrity for these valves.

3.9.3.2.2.2.1 Qualification of Valve Actuators

Each actuator has been qualified to demonstrate its ability to perform its function under all service and environmental conditions. Motors and electrical appurtenances for air actuators are seismically qualified per IEEE 344 and IEEE 323.

3.9.3.2.2.2.2 Check Valves and Safety/Relief Valves

Valves which are safety-related but can be classified as not having an overhanging structure, such as check valves and safety/relief valves, are considered separately.

Due to the particular simple characteristics of the check valves, they were qualified by a combination of the following tests and analysis:

a. stress analysis including the seismic loads where applicable,

b. in-shop hydrostatic test,

c. in-shop seat leakage test, and

d. periodic in situ valve examination and inspection to ensure the functional capability of the valve.

The safety/relief valves are qualified by the following procedures. In-shop hydrostatic seat leakage and performance tests shall be performed. In addition to these tests, periodic in situ valve inspection, as applicable, and periodic valve removal, refurbishment, performance testing and reinstallation are performed to ensure the continued functional capability of the valve.

Using the methods described above, all the safety-related valves in the systems are qualified for operability during a seismic event. These methods conservatively simulate the seismic event and ensure that the active valves will perform their safety-related function when necessary.

TABLE 3.10-1
DYNAMIC QUALIFICATION OF
BOP ELECTRICAL EQUIPMENT

SPEC NUMBER	EQUIPMENT NUMBER	EQUIPMENT NAME	MFG	TYPE/MODEL	LOCATION BDG	LOCATION COL	LOCATION ROW	LOCATION ELEV	EQUIP MOUNTING	Q M	RESULTS	DOCUMENT
K-2880	1SX01FA	SSW STRAINER MOTOR OPERATOR	LMT	SMB-00/WB-1	SH			699				STATUS: C
K-2880	1SX01FB	SSW STRAINER MOTOR OPERATOR	LMT	SMB-00/WB-1	SH			699				STATUS: C
K-2880	1SX01FC	SSW STRAINER MOTOR OPERATOR	LMT	SMB-00/WB-1	SH			699				STATUS: C

6.1 ENGINEERED SAFETY FEATURE MATERIALS

Materials used in the engineered safety feature (ESF) components have been evaluated to ensure that material interactions will not occur that could potentially impair operation of the ESF. Materials have been selected to withstand the service conditions, environmental conditions, and radiation levels encountered during normal operation and any postulated accident.

Coatings used on exterior surfaces, within the primary containment, are suitable for the environmental conditions expected.

6.1.1 Metallic Materials

6.1.1.1 Materials Selection and Fabrication

6.1.1.1.1 Material Specifications

Table 5.2-4 lists the principal pressure retaining materials and the appropriate material specifications for the reactor coolant pressure boundary components. Table 6.1-1 lists the principal pressure retaining materials and the appropriate material specifications for the engineered safety features of the plant.

Pressure retaining components in ESF systems have, in general, been designed for a service life of 40 years, with due consideration of the effects of the service conditions upon the properties of the material, as required by Section III of the ASME B&PV Code, Article NC-2160.

Pressure retaining components of the ESF, in general, have been designed with the following corrosion allowances, in compliance with the general requirements of Section III of the ASME B&PV Code, Article NC-3120:

a.	Ferritic Materials	
1.	water service (excluding portions of the non-buried shutdown service water piping system)	0.08 inches
2.	steam service	0.00 inches (no corrosion allowance)
b.	Austenitic Materials	0.0024 inches

6.1.1.1.2 Compatibility of Construction Materials with Core Cooling Water and Containment Sprays

Subsection 5.2.3.2.3 discusses compatibility of the reactor coolant with materials of construction exposed to the reactor coolant. These same materials of construction are used for the engineered safety feature components.

c. Due to the complexity of the heat dissipation process itself and the consideration of so many varied parameters in selecting a critical weather period for analyzing LOCA, the period selected was the one which showed (1) the maximum temperature occurring at the station intake in 23 years of normal heat rejection to the cooling lake and (2) high evaporative losses resulting from the cooling lake due to the heat rejected.

The analysis period chosen provides the worst case for heat to be transferred from the UHS based on the recorded weather data. The interaction of a large number of parameters have been considered as required by Regulatory Guide 1.27. Since both evaporative conditions, and intake temperatures were considered throughout the entire analysis period, this analysis is actually more conservative than the analysis required by Regulatory Guide 1.27.

Makeup water and seepage losses were not considered while analyzing the UHS under postulated LOCA. The anticipated temperatures of the UHS as a function of time are shown in Figures 9.2-9 and 9.2-10. Figure 9.2-18 shows the anticipated temperatures of the UHS at the station intake, discharge and UHS midpoint during the heat dissipation process under LOCA. Figure 9.2-10 shows the lake natural temperatures occurring during the period of the postulated LOCA.

This analysis was based on preliminary UHS data. The analysis was based on a total UHS surface area of 148 acres, and a volume of 915 acre-feet. The UHS as constructed has a surface area of 158 acres and a volume of 1067 acre-feet. This increases the conservatism of the analysis. Additionally, the auxiliary heat loads used for the analysis (90.65×10^6 Btu/hr) is higher than the actual tabulated auxiliary heat load shown in Table 9.2-3 (72.4×10^6 Btu/hr).

The cooling lake, in combination with the submerged pond, provide an ultimate heat sink in accordance with the requirements of Regulatory Guide 1.27. The ultimate heat sink is capable as shown by the analysis of providing sufficient cooling for more than 60 days to shutdown and cooldown both units following the design-basis accident.

9.2.5.4 Testing and Inspection

A sedimentation monitoring program is implemented to ensure that sediment deposition does not infringe upon the required storage capacity in the submerged pond.

9.2.5.5 Instrumentation Application

Instrumentation is not necessary for the ultimate heat sink.

TABLE 9.2-3

ULTIMATE HEAT SINK AUXILIARY* LOADS FROM THE SHUTDOWN SERVICE WATER SYSTEM

EQUIPMENT	HEATLOAD (10^6 Btu/hr)
Shutdown Service Water Pump Room Coil Cabinets (3)	0.66
Fuel Pool Cooling and Cleanup Heat Exchangers (2)	33.2
Control Room Chillers (2)	3.12
RHR Heat Exchanger Room Coolers (2)	0.56
Division 1 and 2 Diesel-Generator Heat Exchangers	23.35
Division 3 Diesel-Generator Heat Exchanger	6.93
Diesel Switchgear Heat Removal Units	1.70
RHR Pump Room Coolers	0.82
RCIC Pump Room Cooler	0.10
LPCS Pump Room Cooler	0.37
HPCS Pump Room Coolers	0.59
SBGT Room Coolers	0.42
Hydrogen Recombiner Room Cooler	0.22
Inverter Room Coolers	0.05
MSIV Leakage Room Coolers	0.13
RHR Pump Seal Coolers	0.10
HG Room Cooling Coil Cabinet	0.10
Total	72.42

*RHR Heat Exchangers Included Elsewhere.

241.8 (2.5.4.5.3) (a) Provide a longitudinal subsoil profile along the ECCS Pipeline from the Screen House to the Station and from the Station to the Outlet structure. Show the zones of soft material and loose material which were replaced by competent material during construction. (b) Provide transverse cross sections showing the pipe, concrete mudmat, and all backfill materials, (c) Show details of backfill and placement near the connection between pipes and structure. What are the estimated total and differential settlement of these points? (d) Provide a figure similar to Figure 2.5-376 for ECCS pipe between the station and ECCS outlet structure.

RESPONSE

This question is assumed to apply to buried shutdown service water system (SSWS) piping outdoors. There is no ECCS piping buried outdoors.

(a) A longitudinal subsoil profile along the SSWS pipeline is presented in Figures 1 and 2 . The excavation line for the pipeline is illustrated. The zones of soft and loose material that were removed are shown as over-excavation beneath the pipeline. (Overexcavation is considered to be any excavation greater than 1.5 feet below the bottom of the lower pipe).

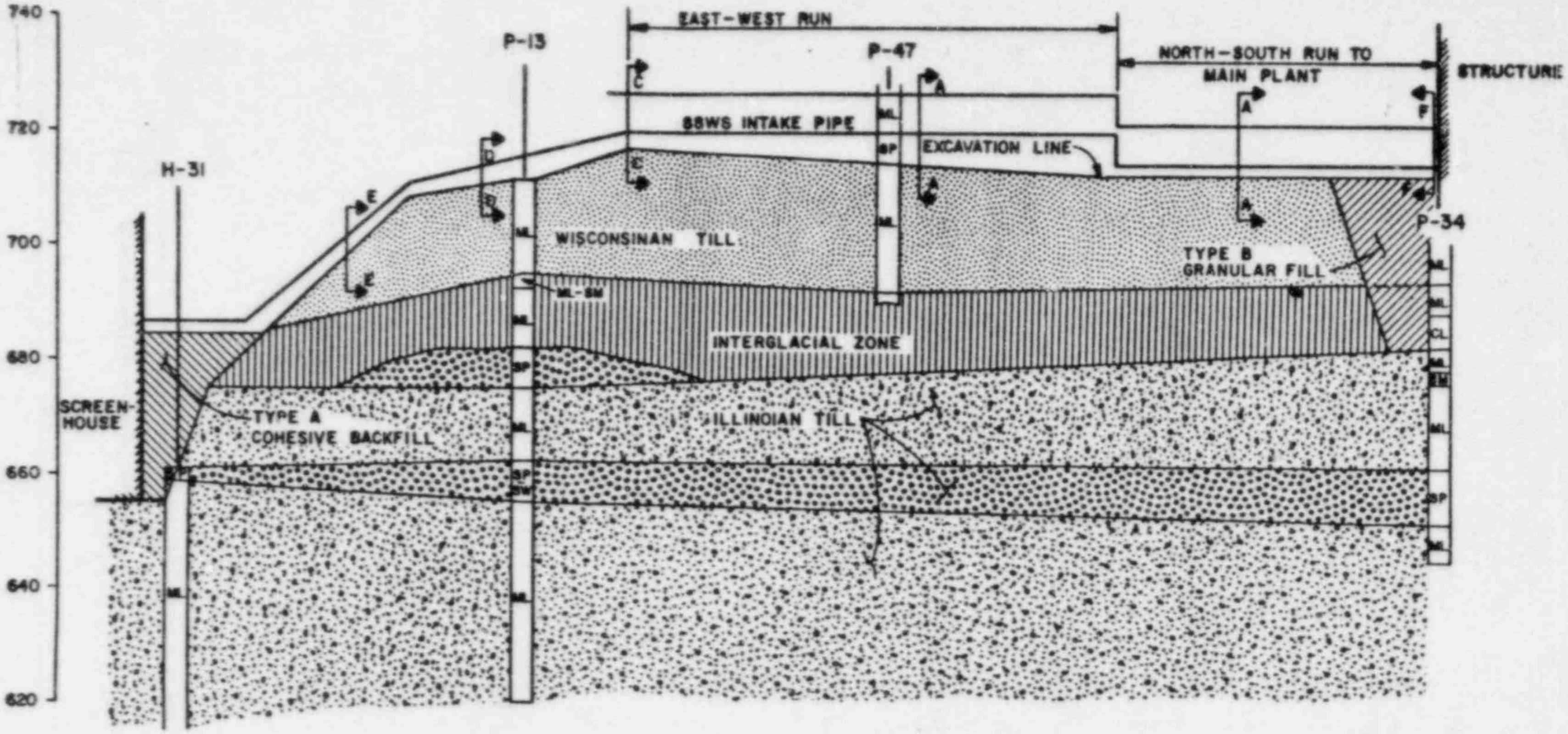
(b) Transverse cross sections showing the pipe, concrete mudmat, and all backfill materials are presented in Figure 3.

(c) The details of the backfill placement near the connection between pipes and structure are shown in Section F-F of Figure 3.

The estimated total settlement for the structure (Diesel Generator Building) where the SSWS pipes enter is 1 inch. This settlement is based on the estimated total settlement of the structure (Figure 2.5-436) beginning January 1, 1979. This is the approximate date of the connection of the first pipe to the structure. If it is assumed that the pipeline will not settle, the estimated differential settlement between the pipeline and structure will also be approximately 1 inch.

(d) A figure showing the fly ash placement from the SSWS outlet structure and along the pipeline to the main plant is shown in Figure 4.

(See revised Figure 2.5-376.)



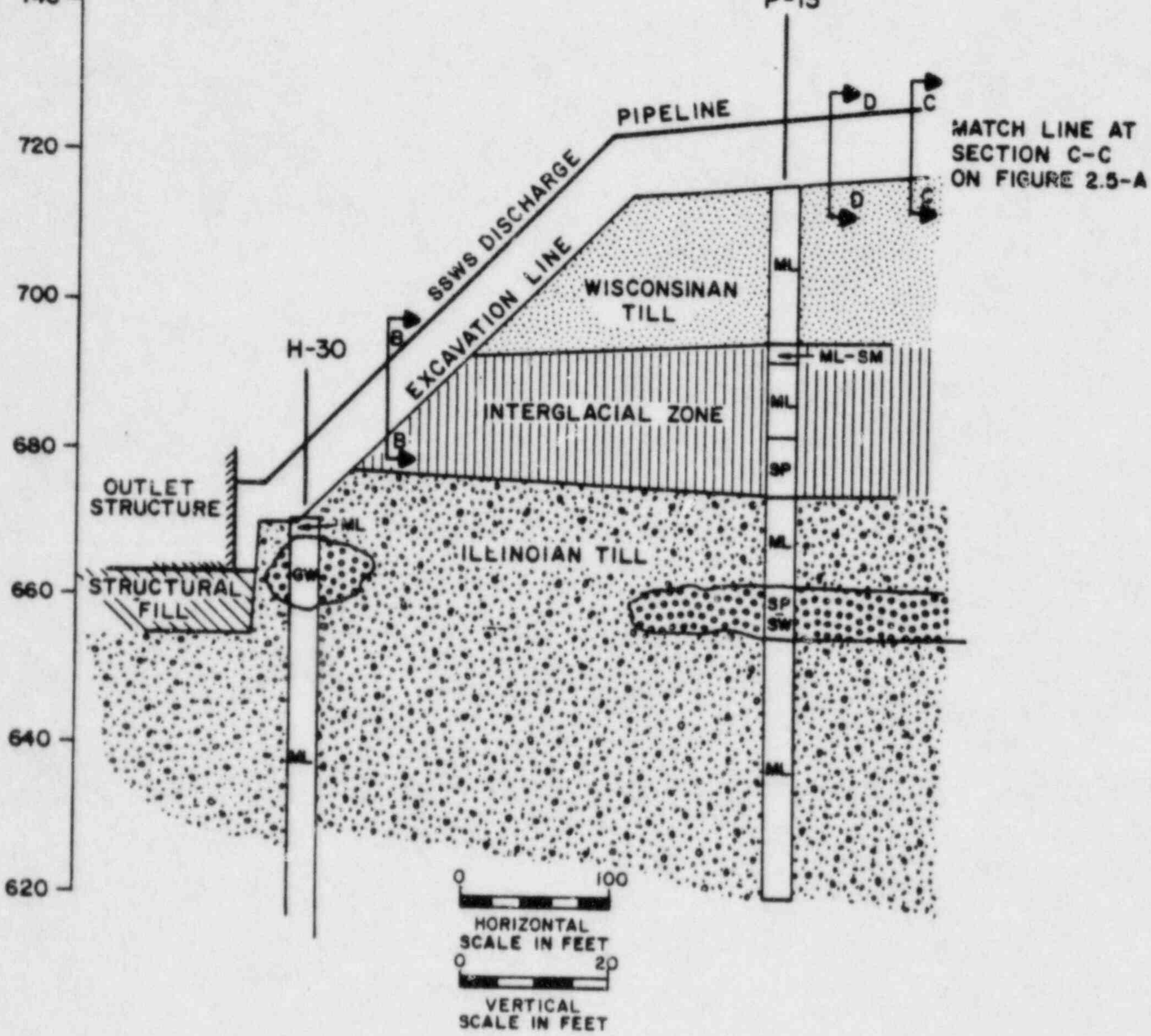
NOTES

1. REFER TO FSAR FIGURE 2.5-372 FOR GEOLOGIC SECTION BELOW ELEVATION 620 FEET.
2. SEE FIGURE C2.5-23 FOR PLAN VIEW OF ECCS PIPELINE EXCAVATION.
3. SECTIONS SHOWN ON FIGURE C.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 1

GEOLOGIC PROFILE ALONG SSWS PIPELINE - SCREEN HOUSE TO MAIN PLANT

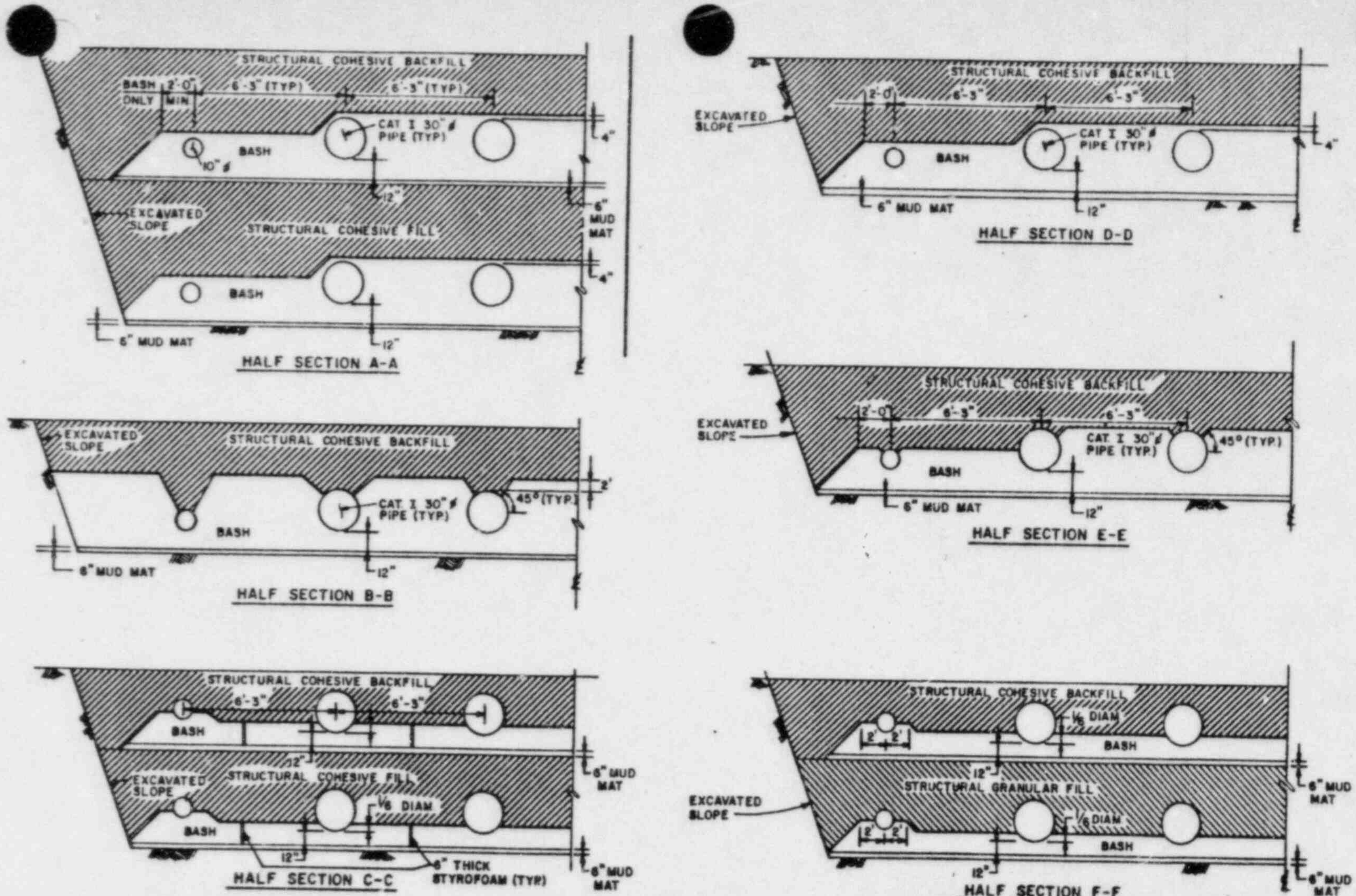


SEE NOTES ON FIGURE 2.5-A
FOR REFERENCE FIGURES.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 2

GEOLOGIC PROFILE ALONG
SSWS PIPELINE - OUTLET STRUCTURE
TO MAIN PLANT



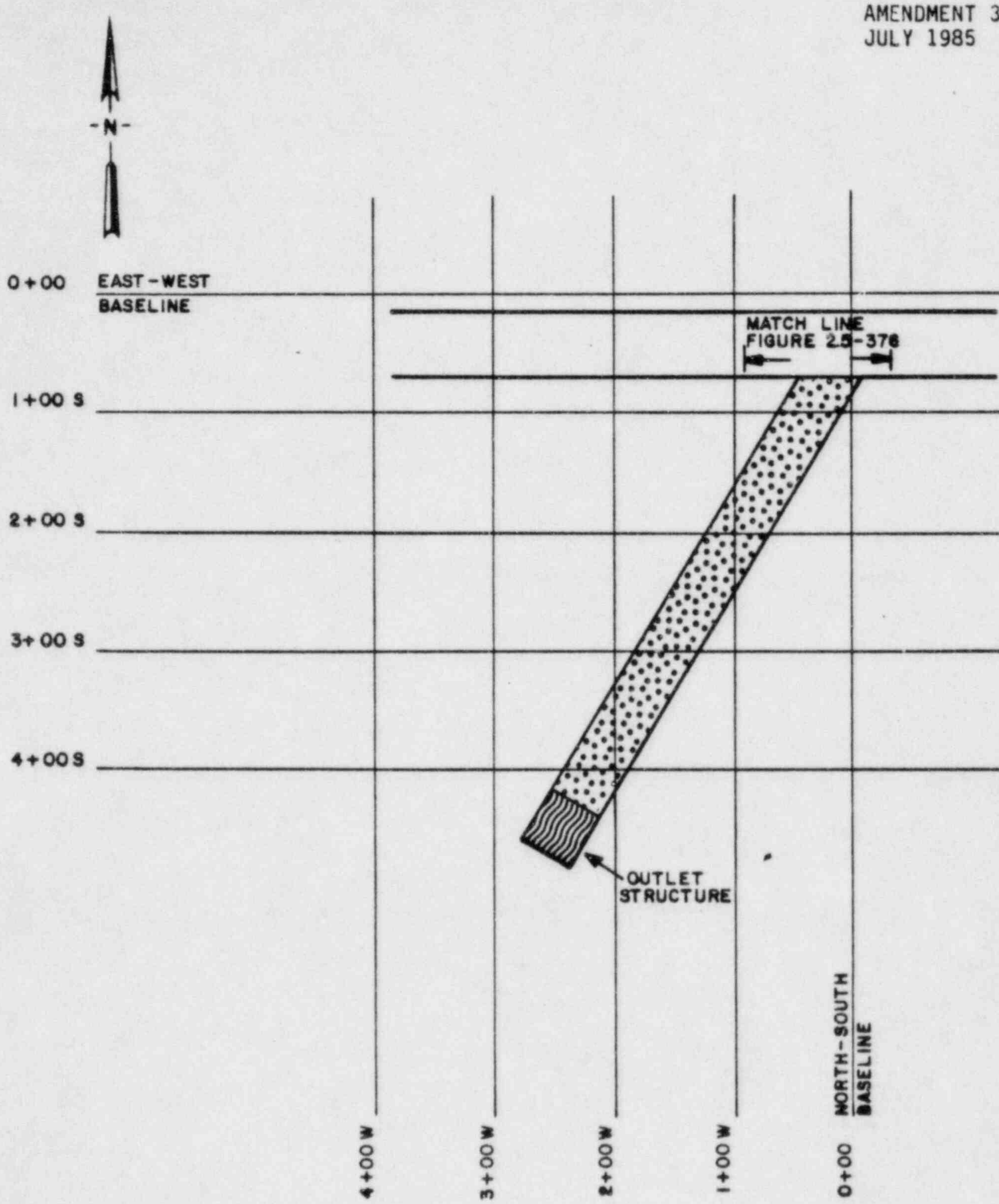
NOTES:

1. SECTIONS GIVEN ARE HALF SECTIONS AND ARE SYMMETRICAL ABOUT THE CENTERLINE.
2. SECTION C-C IS TYPICAL FOR ALL BEND LOCATIONS ALONG PIPELINE.
3. SECTION F-F IS FOR AREA IMMEDIATELY ADJACENT TO MAIN PLANT STRUCTURE ONLY.
4. LOCATION OF SECTIONS SHOWN ON FIGURES 2.5-A AND B.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 3

TYPICAL CROSS SECTIONS - SSWS PIPELINE



NOTE

SEE FIGURE 2.5-376 FOR KEY.

CLINTON POWER STATION
FINAL SAFETY ANALYSIS REPORT

FIGURE 4

FLY ASH MIXTURE AS FILL AND BACKFILL FOR THE SSWS DISCHARGE PIPELINE

241.9 (2.5.4.8) Provide a discussion of the liquefaction potential of the natural material in the vicinity of ECCS piping.

RESPONSE

The question is assumed to apply to buried shutdown service water system (SSWS) piping outdoors. There is no ECCS piping buried outdoors.

The material used as structural backfill around the SSWS piping consisted of concrete, bash, and Type A cohesive material. These materials are not susceptible to liquefaction and thus not likely to liquefy.

As discussed in Attachment C2.5, Geologic Mapping, the subgrade for the SSWS piping consisted of the Wisconsinan Till of the Wedron Formation. This till consists of cohesive material with isolated and discontinuous pockets of sand and silt randomly distributed within the till. The cohesive material is not susceptible to liquefaction and thus not likely to liquefy.

Some small isolated sand pockets were encountered during the excavation for the SSWS pipeline. These are shown on Figure C2.5-23. In-place density tests were performed in these areas. The results of these tests indicate that these sand pockets have an in-place relative density greater than 82.5%. Based on the facts that the sand pockets are confined, discontinuous, and that they have an in-situ relative density greater than 82.5%, they are not considered to be very likely to liquefy.

241.10 (2.5.4.7) (a) Provide quantitative and procedural details of the dynamic analysis of the buried ECCS piping. (b) How are the static and dynamic properties of insitu soils, flyash, and structural fill considered in the analyses?

RESPONSE

This question is assumed to apply to buried shutdown service water system (SSWS) piping outdoors. There is no ECCS piping buried outdoors.

(a) Details of the dynamic analysis of buried SSWS piping are included in Subsection 3.7.3.12.

(b) Parameters selected for the analysis are discussed in revised Subsection 3.7.3.12.

(See revised Subsection 3.7.3.12.)

220.01 (3.3.2.2) The fourth load combination equation (i.e., $w_t = w_w + w_p$) to determine total tornado loads differs from the one given in SRP Section 3.3.2.II.3(d). Discuss, if the use of FSAR equation provides same conservatism as SRP equation or not. If not, provide justification for using FSAR equation.

RESPONSE

The intent of SRP No. 3.3.2 is to simplify the analysis and design of the structure for a tornado load based on the maximum wind velocity with the corresponding pressure drop without going into the detail of actual load distribution based on its location. The resulting total tornado load is equal to the maximum wind pressure plus a pressure drop of 1.5 psi (half the maximum 3 psi). This is formulated into Eq. (iv) and Eq. (vi) of SRP Section 3.3.2.II.3(d).

On the Clinton Project, the overall analysis of structures for the tornado load is based on the distribution of curves as shown in Figure 3.3-3. At any particular location the total tornado load is equal to the tornado load plus pressure drop. Therefore, this can be formulated as shown in the fourth load combination equation. The overall effect of the total tornado load on the structure is maximized by shifting its tornado center along the structure. Although the load combination equations for the total tornado loads used on the Clinton Project differ from those given in SRP Section 3.3.2.II.3(d), they are acceptable for determining the tornado loads for overall design of the structure.

The sixth load combination equation will be revised as follows based on the above explanation:

$$\text{(vi)}\ W_t = W_w + W_p + W_m$$

For determining the tornado loads for the local design of structures on the Clinton Project, a maximum wind pressure plus its corresponding pressure drop (1.5 psi) as shown in Figure 3.3-3 were used. Although the load combination equations used for total tornado loads differ from those equations given in SRP Section 3.3.2.II.3(d), their numerical values are identical:

SRP equation

$$W_t = W_w + 0.5\ W_p + W_m$$

$$W_t = 232 + 0.5\ (3)\ (144) + W_m$$

$$W_t = 448 + W_m$$

Clinton equation

$$W_t = W_w + 1.0\ W_p + W_m$$

$$W_t = 232 + 1.0\ (1.5)\ (144) + W_m$$

$$W_t = 448 + W_m$$

W_m is the same in both equations.