Point Beach Unit 1/Unit 2 Fuel Assembly Inspection Program

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Inspection work was conducted at Point Beach by an NSD crew under the supervision of PPE contract engineer Jim Kisak. Responsibility for the reduction and verification of individual portions of the inspection program was assigned to various PPE engineers. Their signatures on this document attest that (1) they have independently verified the sections assigned to them; and (2) they concur with the results documented herein. A listing of the individual data reduction and verification assignments is given below:

	Inspection Program Section	Originating Engineer	Verifying Engineer
1.0	Background & Objectives	A. Konzel	D. Colburn
2.0	Full Length RCCA Drag Tests	D. Davis	D. Colburn
3.0	Guide Thimble Plug Gage Exams	J. Halligan	D. Davis
4.0	F/A Length Measurements	H. Kunishi	A. Konzel
5.0	Rod to Nozzle Gap Measurements	H. Kunishi	A. Konzel
6.0	Overall Summary	D. Colburn	A. Konzel

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1.0 Background and Objectives

An RCCA insertion anomaly was experienced at Wolf Creek near the end of Cycle 8. The reactor tripped resulting in a SCRAM. During this SCRAM, five RCCAs failed to fully insert. Wolf Creek conducted cold drop tests after the anomaly, and three additional RCCAs did not fully insert. A subsequent inspection program (PPE-96-088) concluded that the direct a,b,c

[ ]

The following tests were scheduled to be conducted during the inspection program:

(1) RCCA Drag Tests;
(2) Guide Thimble Plug Gage Exams (Single Tube Probe Tests);
(3) Fuel Assembly Length Measurements; and
(4) Fuel Rod-to-Nozzle Gap Measurements.

Fuel assembly length measurements and fuel rod-to-nozzle gap measurements were needed to establish that the growth of the fuel assemblies and fuel rods is within the anticipated range for the listed F/A burnup.

2.0 Full Length RCCA Drag Tests in Spent Fuel Pool

Fuel assemblies fabricated for four different contracts were drag tested in the spent fuel pool. The specific fuel features for each assembly are shown in Table 2.1. All of the assemblies share the following common features:

- High Burnup
- Removable Top Nozzle
- Debris Filter Bottom Nozzle
- Solid Axial Blanket (natural UO_2)
- Integral Fuel Burnable Absorbers (IFBA)

The Vantage 5 fuel features with [ ] the intermediate flow mixer (IFM) grid were used in fuel assemblies manufactured for contracts WEHQ, WEIQ and WIFQ. Fuel assemblies manufactured for contract WEFQ did not have solid axial blankets (ABN) nor integral fuel burnable absorbers (IFBA).

Table 2.1: Fuel Features of Point Beach 14x14 Optimized Fuel Assemblies

[ ] a,b,c

The drag test results are tabulated in Table 2.2 As shown in the table, some fuel assemblies were recently discharged from the reactor core and others have been in the spent fuel pool for up to 2 cycles.

a,b,c

[ ]

Table 2.2: Point Beach Drag Test Data

a,b,c

[ ]

Figure 2.1 Point Beach Dashpot and Guide Thimble Drag Data

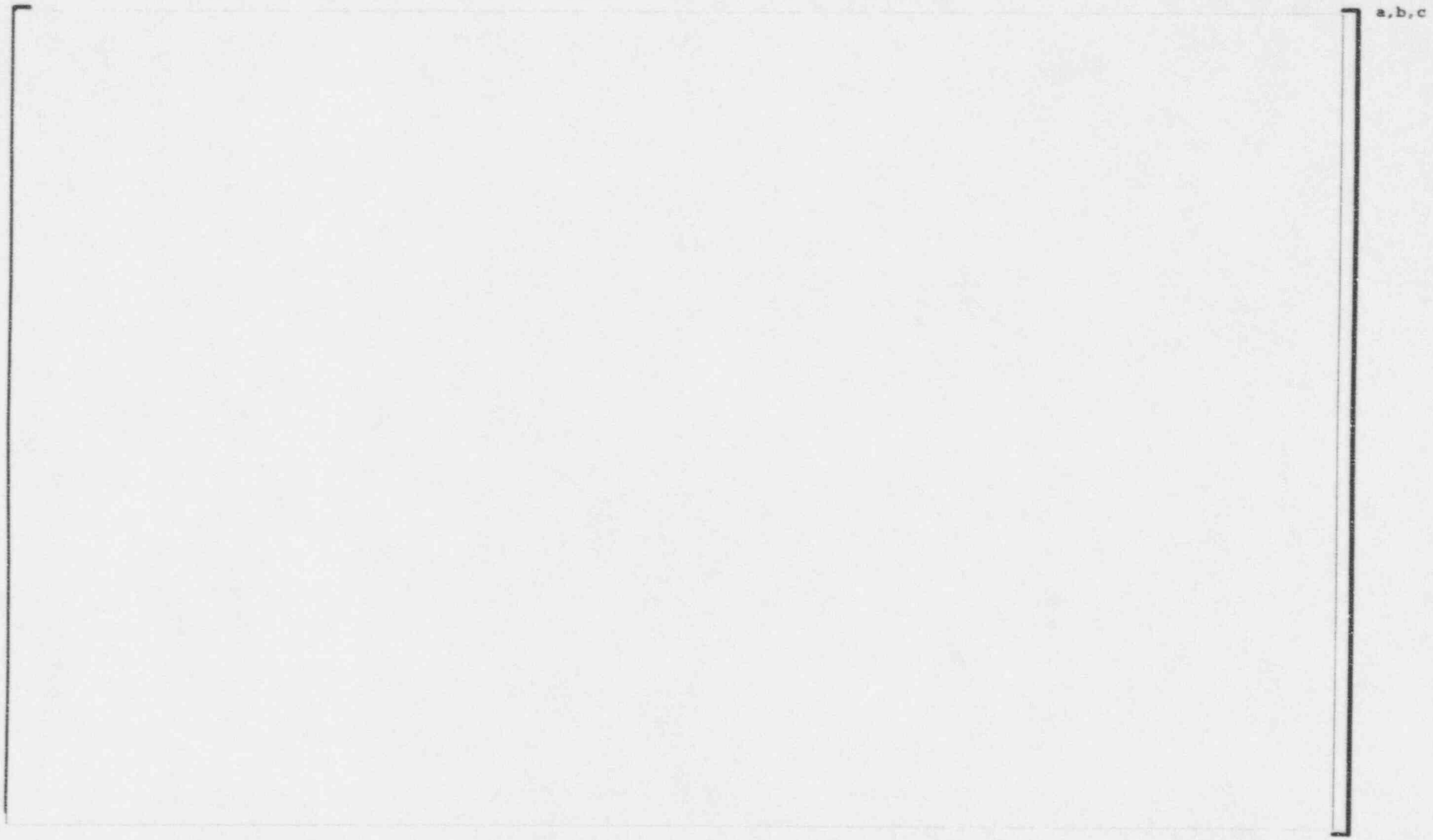
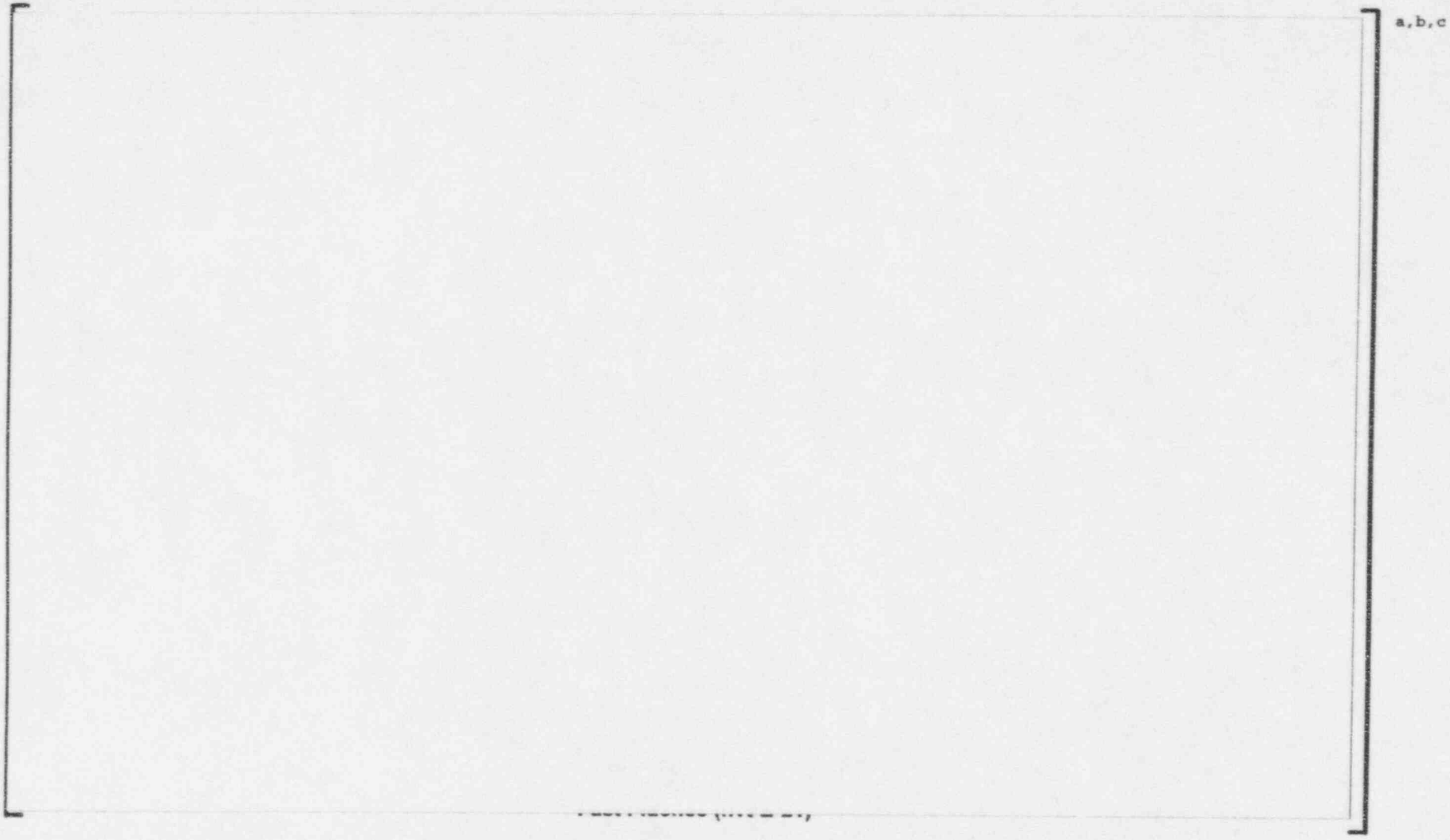


Figure 2.2: Point Beach Dashpot Drag and Fast Fluence Data



a,b,c

Figure 2.3: Point Beach Guide Thimble Drag and Fast Fluence Data

3.0 Single Tube Probe

Single tube probing was conducted on two fuel assemblies at Point Beach. The assemblies were selected based on their high burnup and high drag measurements as summarized below :

a,b,c

[ ]

F/A Z11 Results

a,b,c

[ ]

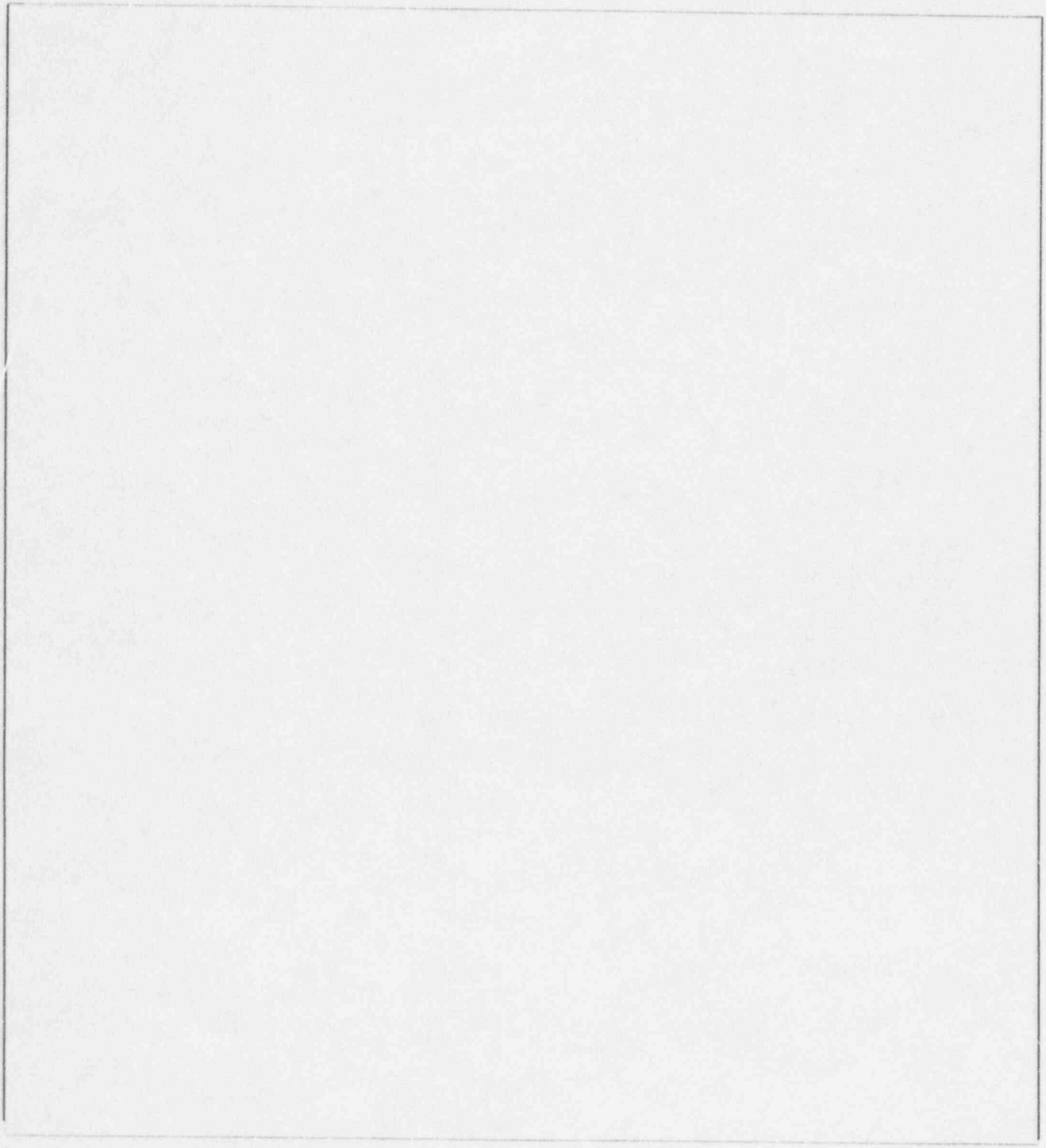
F/A Y11 Results

a,b,c

[ ]

Figure 3.1

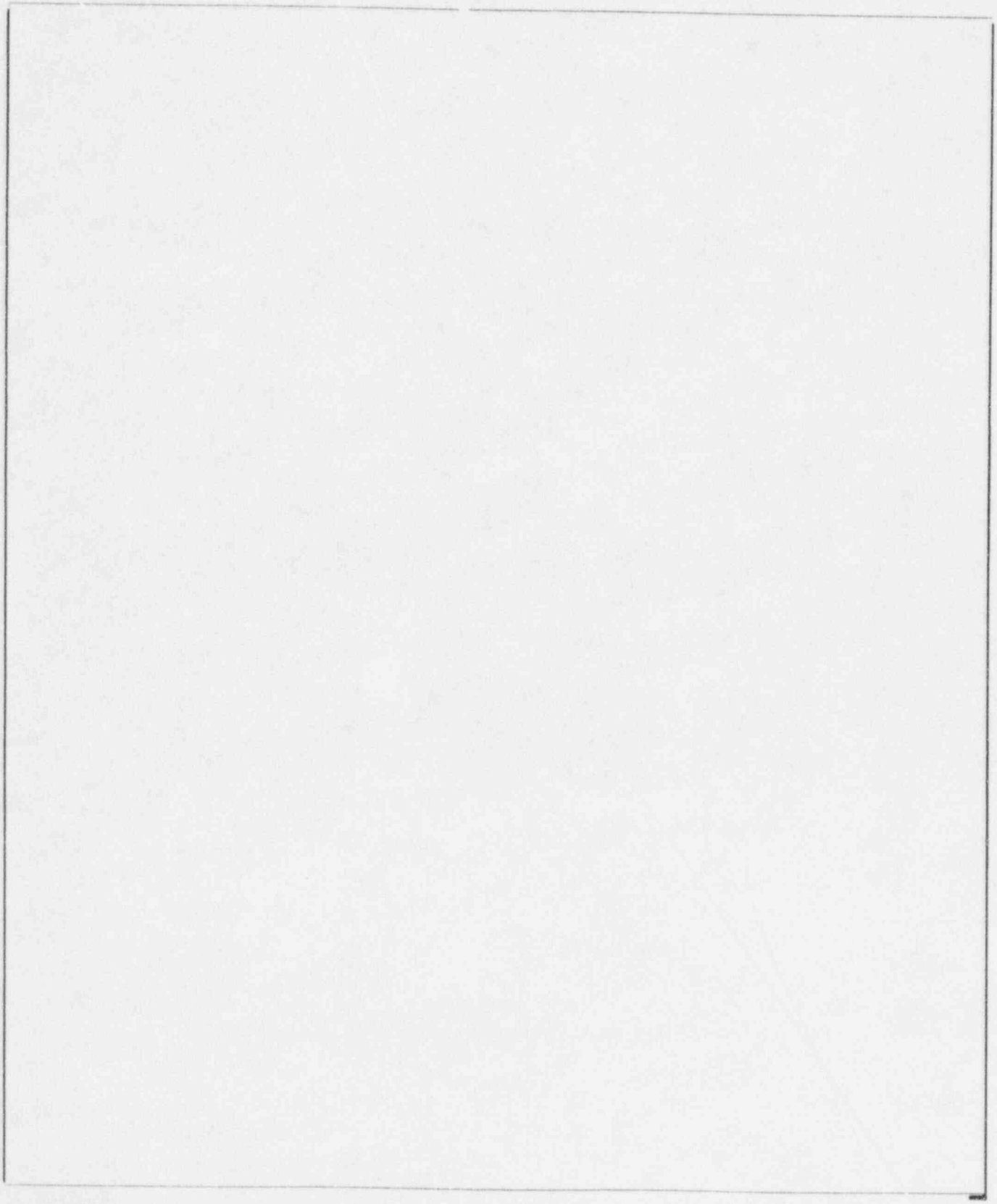
DASHPOT PROBES "GO/NO GO"
14x14 FUEL ASSEMBLIES



a,b,c

Figure 3.2

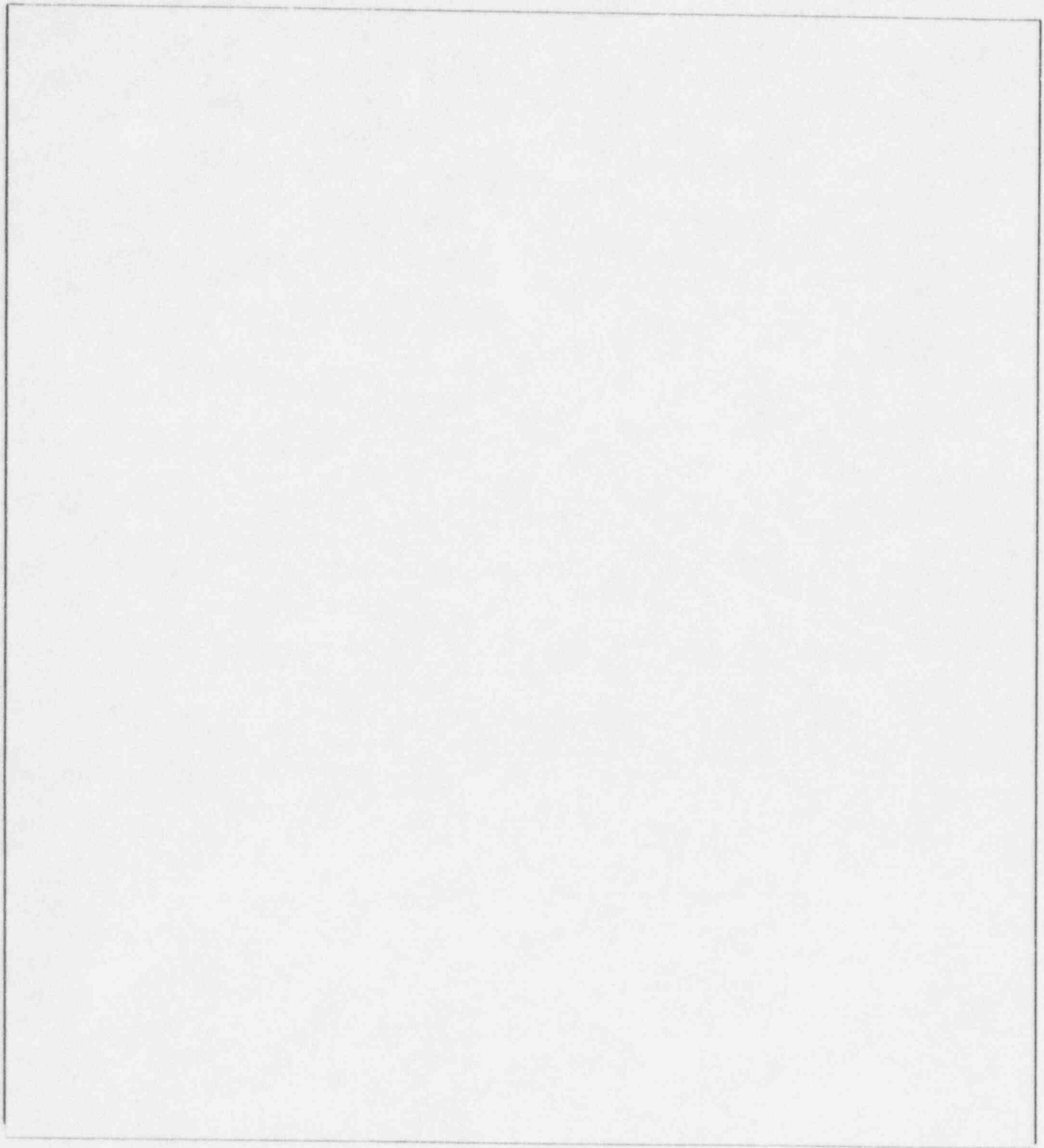
GUIDE THIMBLE PROBES "GO/NO GO"
14x14 Fuel Assemblies



a,b,c

Figure 3.3

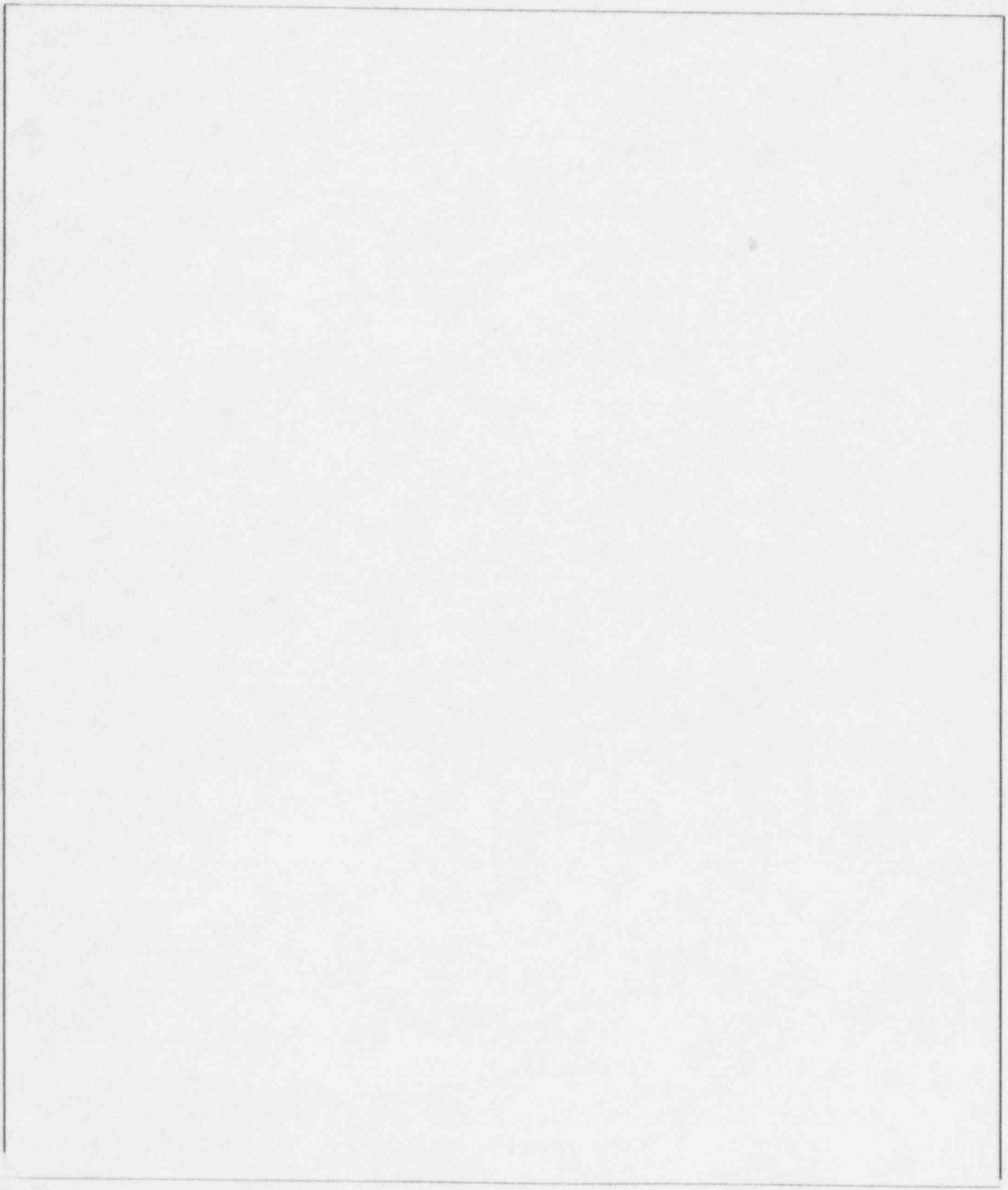
POINT BEACH DASHPOT PROBES
F/A Z11



a,b,c

Figure 3.4

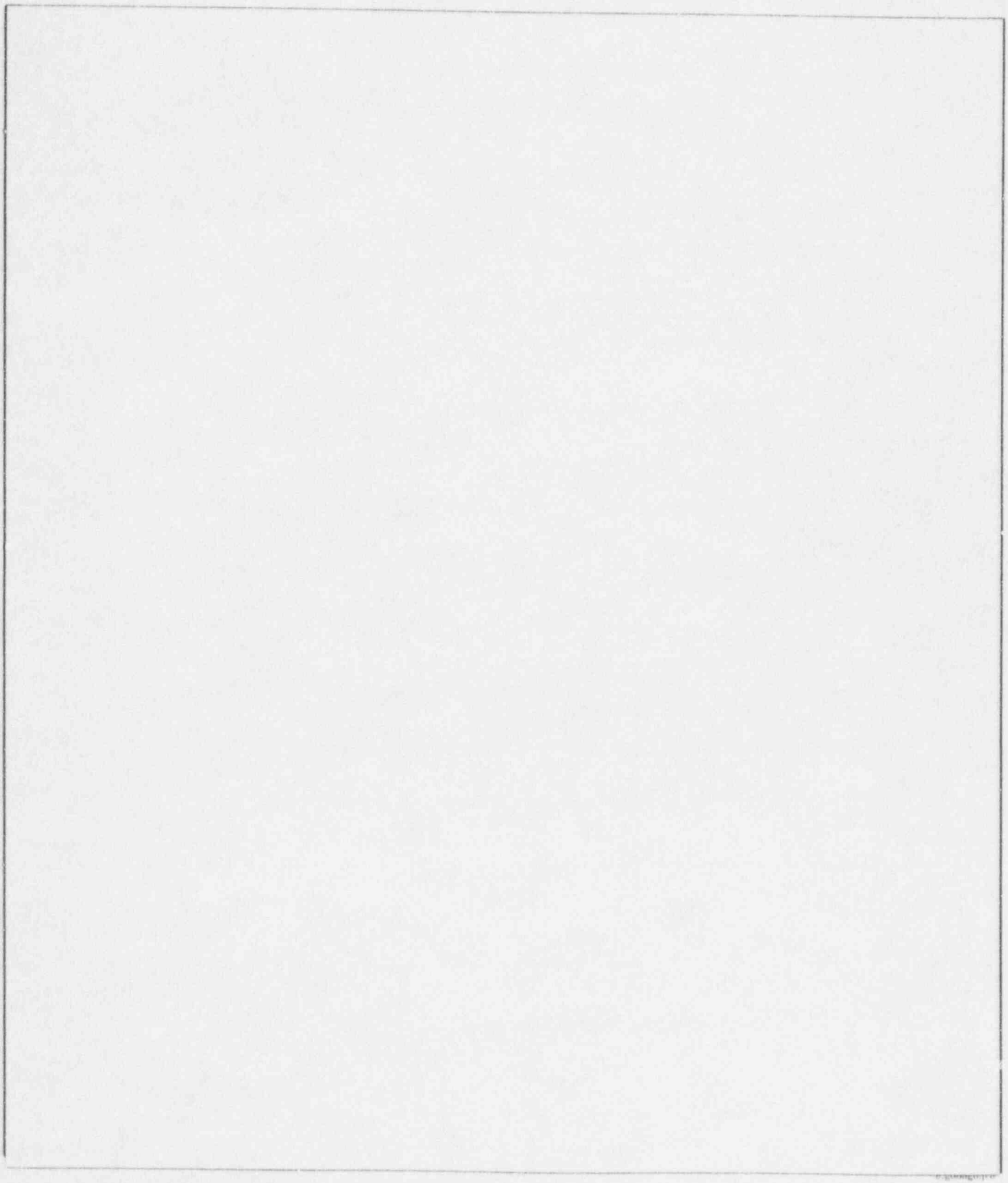
POINT BEACH GUIDE THIMBLE PROBES
F/A Z11



a,b,c

Figure 3.5

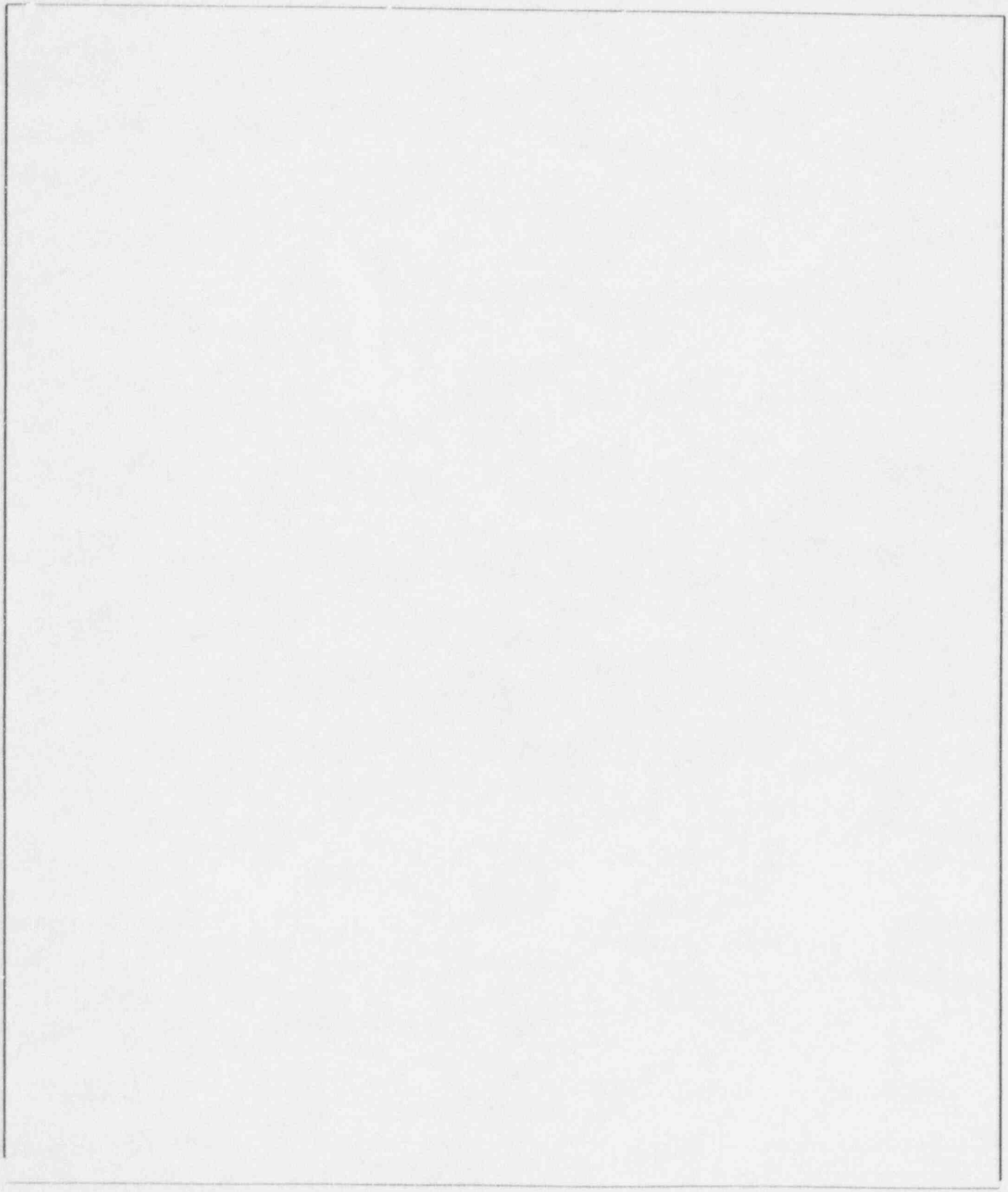
POINT BEACH DASHPOT PROBES
F/A Y11



a,b,c

Figure 3.6

POINT BEACH GUIDE THIMBLE PROBES
F/A Y11



a,b,c

4.0 Fuel Assembly Growth

Assembly length measurements were performed on a total of 10 assemblies (6 from Unit 1 and 4 from Unit 2). The measurements were made using a standard of known length and a measuring device with a dial indicator. The data was corrected for the spent fuel pool water temperature. Table 4.1 lists the measured growth for each of the 10 assemblies.

All 10 assemblies are of the 14x14 OFA design. Thimble tube material of assemblies V75, V76, V77, V78, Y11, and Z11 is Improved Zircaloy-4; that of V17,V20,V22, and V26 is standard Zircaloy-4.

a,b,c

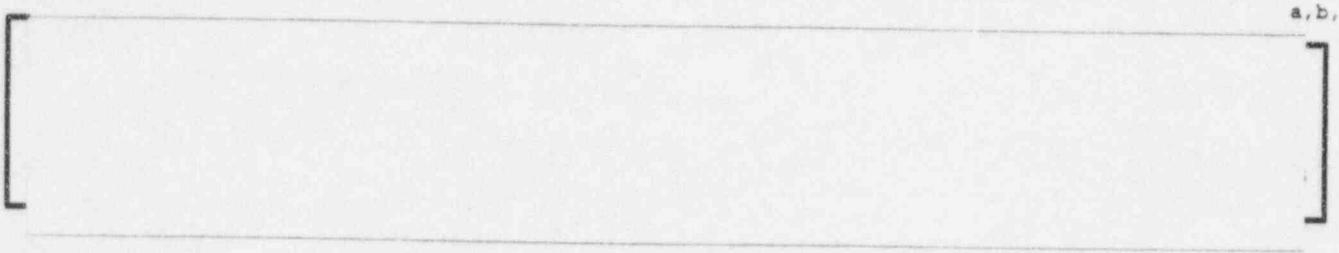


Table 4.1: Point Beach Fuel Assembly Growth Data

a,b,c

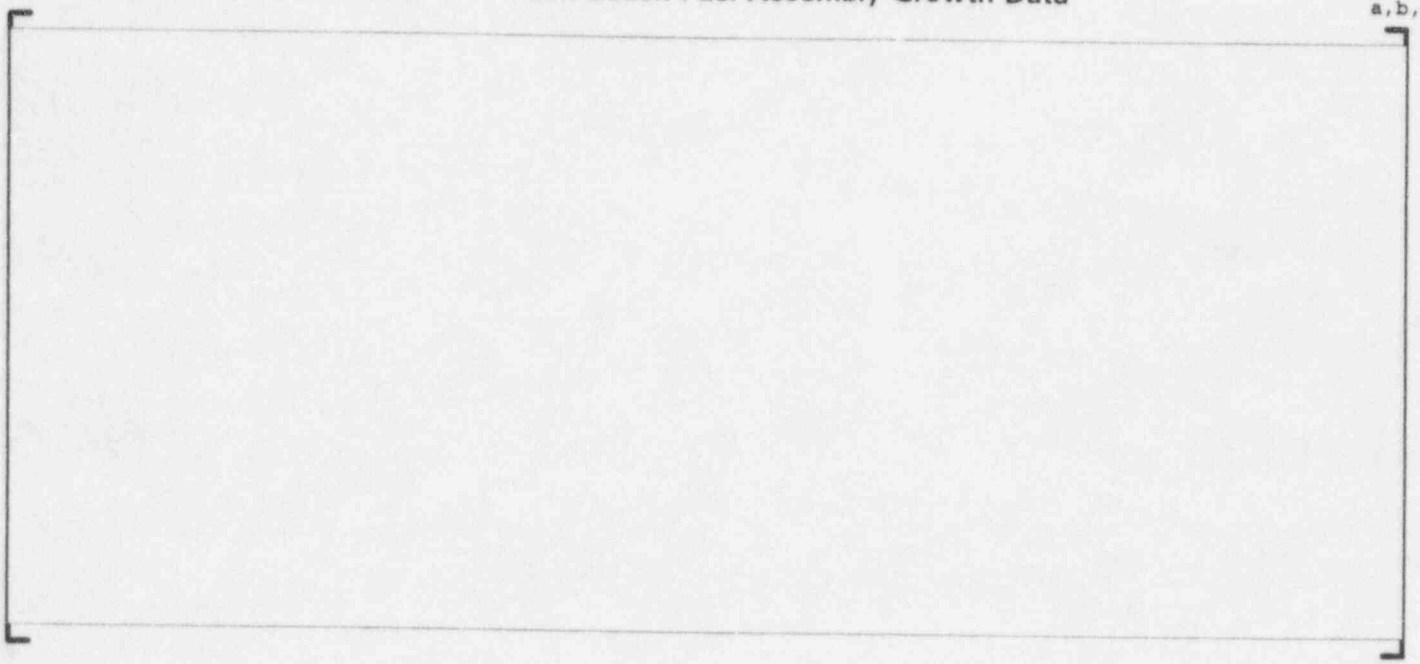
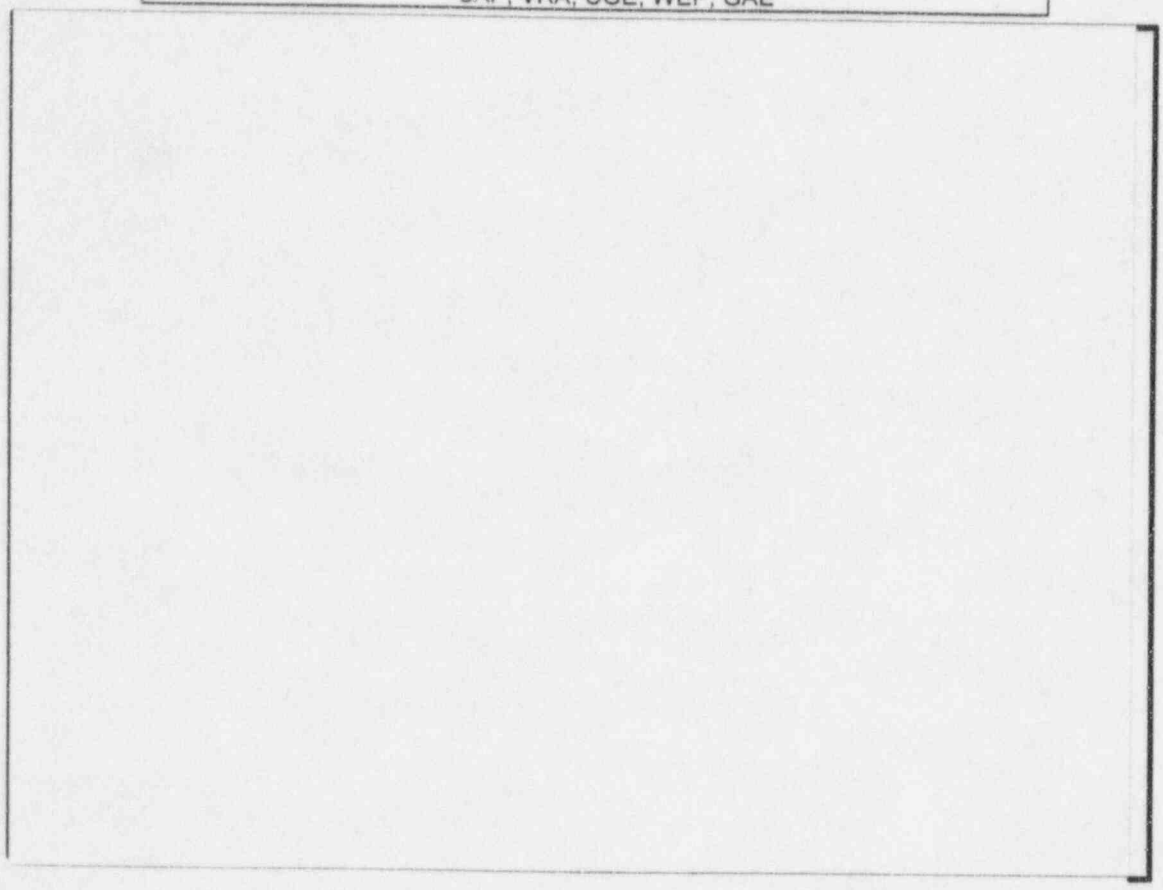


Figure 4.1: Fuel Assembly Growth
SAP, VRA, CGE, WEP, GAE

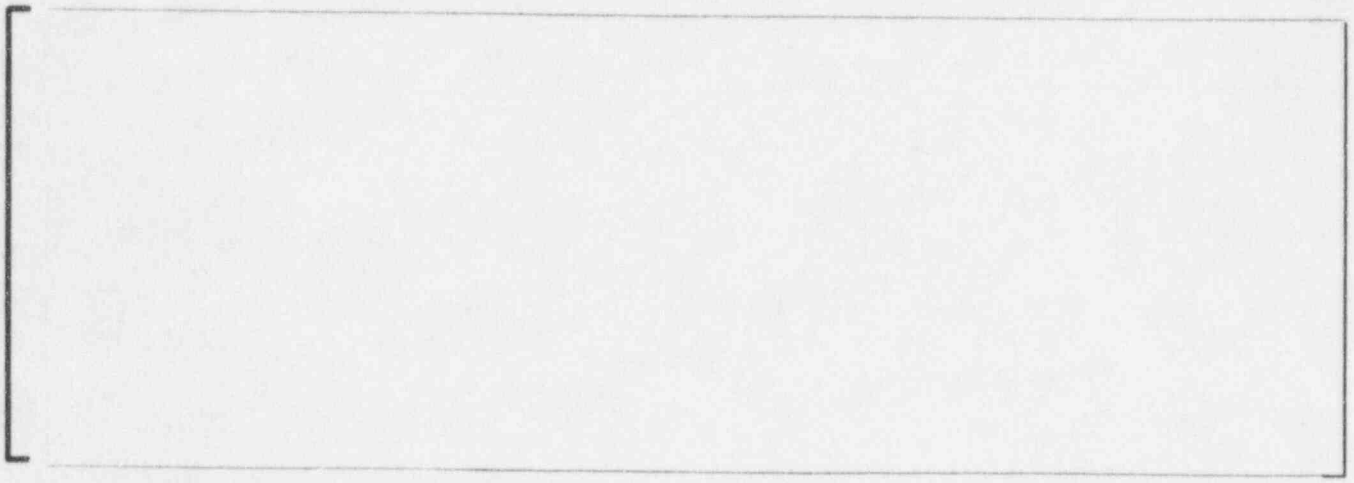


a,b,c

5.0 Fuel Rod Growth

The axial gaps between each peripheral rod and the assembly nozzles were measured from the low magnification TV tapes of 10 assemblies to determine fuel rod growth. The F/A Ids of th measured assemblies are V75, V76, V77, and V78 from Unit 2 and V17, V20, V22, V26, Y11, and Z11 from Unit 1.

a,b,c



a,b,c

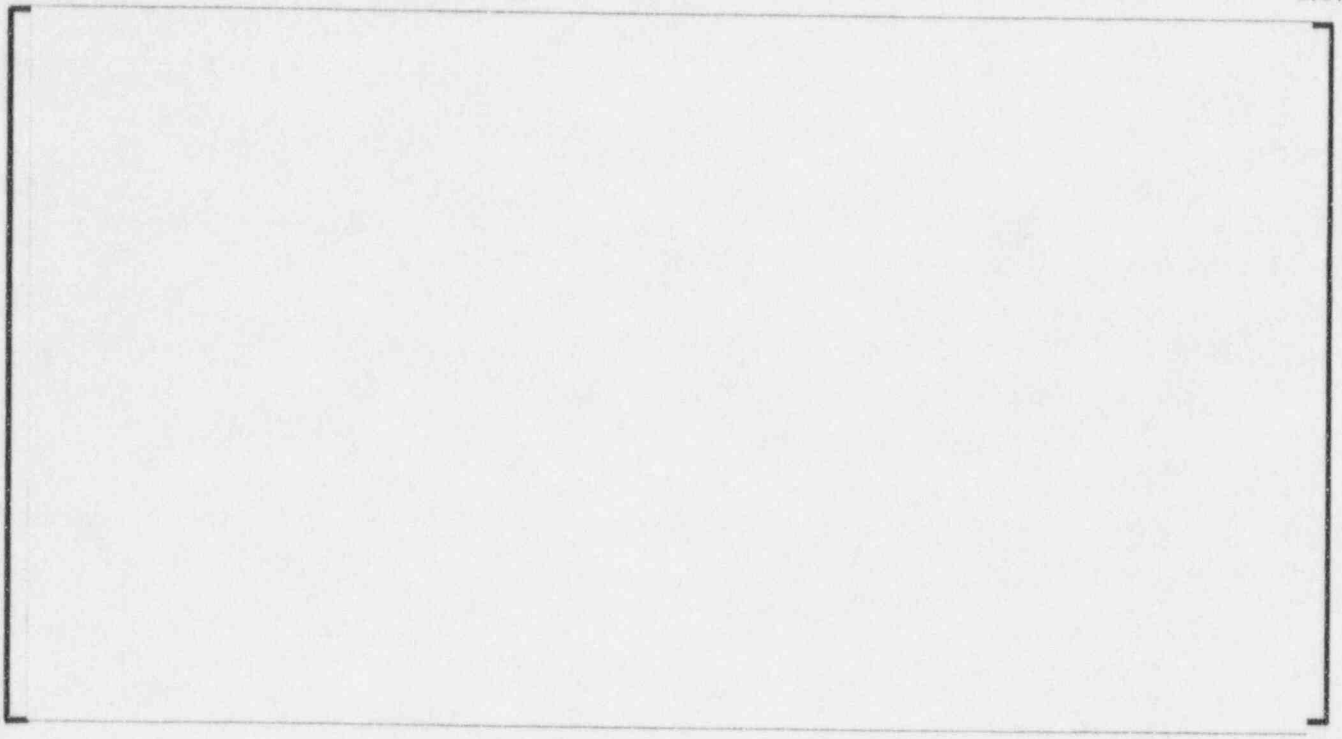


Table 5.1: Summary of Point Beach Assembly Average Rod Growth

a,b,c

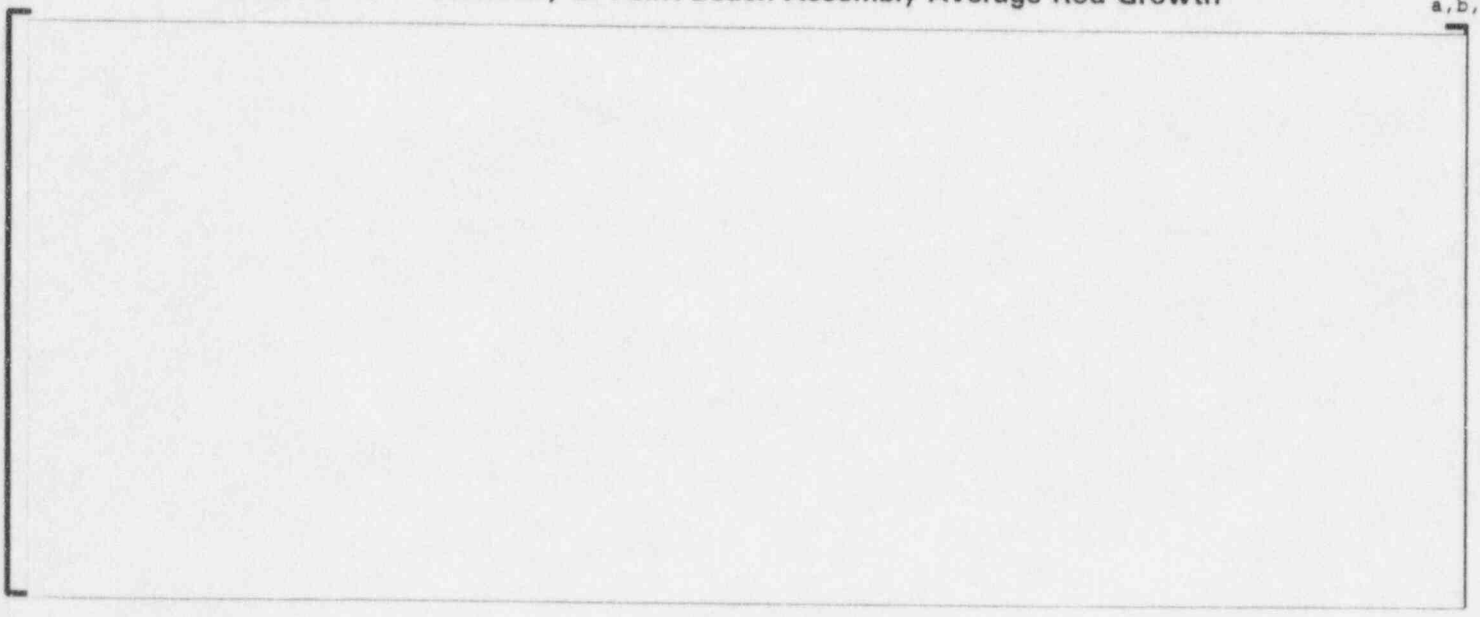


Figure 5.1: Assembly Average Rod Growth Data

a,b,c

[ ]

6.0 Overall Summary

Fuel assemblies tested at Point Beach displayed high drag forces in the lower part of the guide thimble major diameter in some assemblies. The contribution of the dashpot to the total drag (when the bottom of the RCCA is in the dashpot) was lower than that observed in the 17x17 fuel designs.

a,b,c

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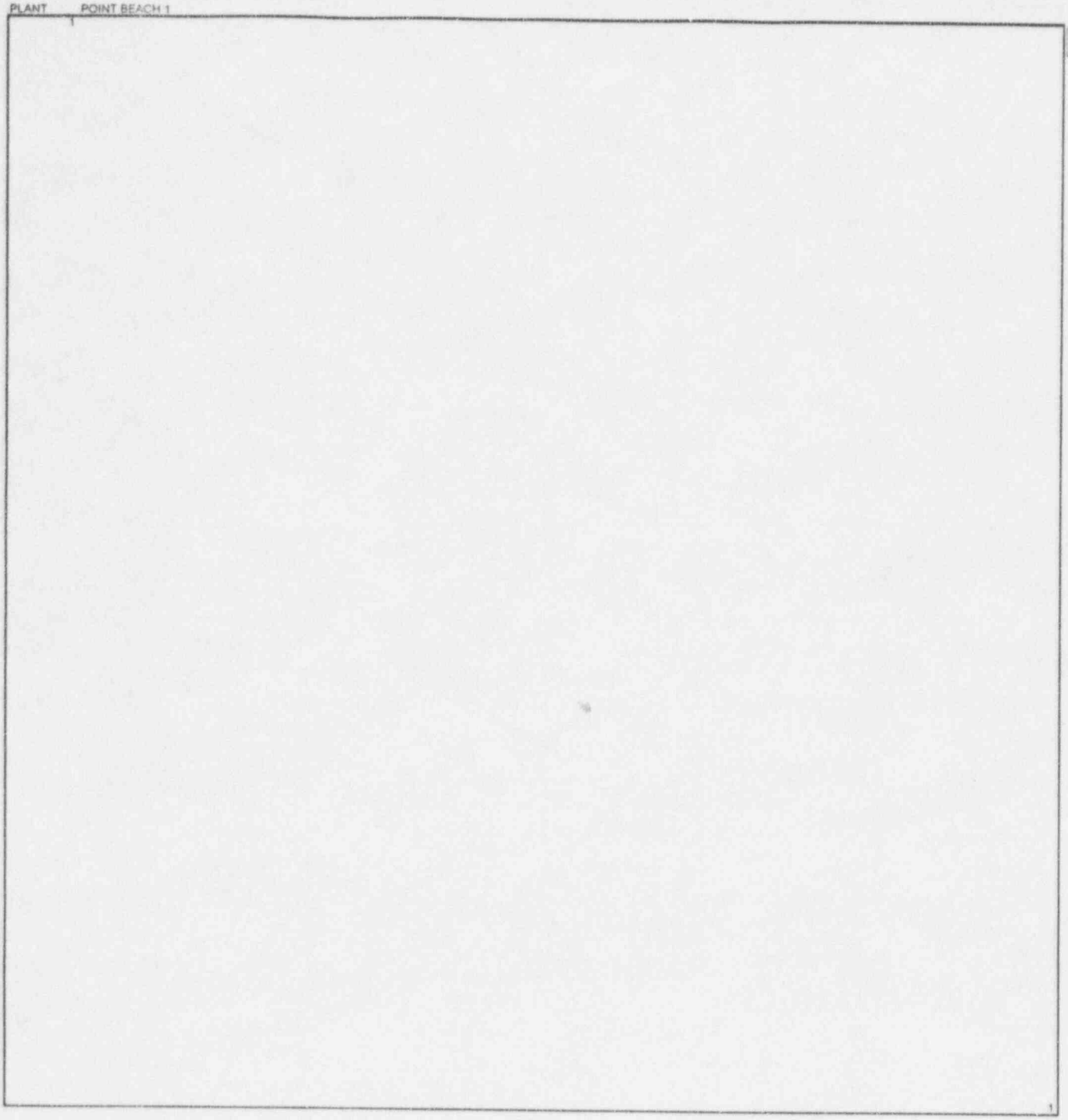
Appendix 'A'

Fuel Rod Growth Data Tables

PLANT POINT BEACH 1



B. D. C

PLANT POINT BEACH 1

a, b, c

1

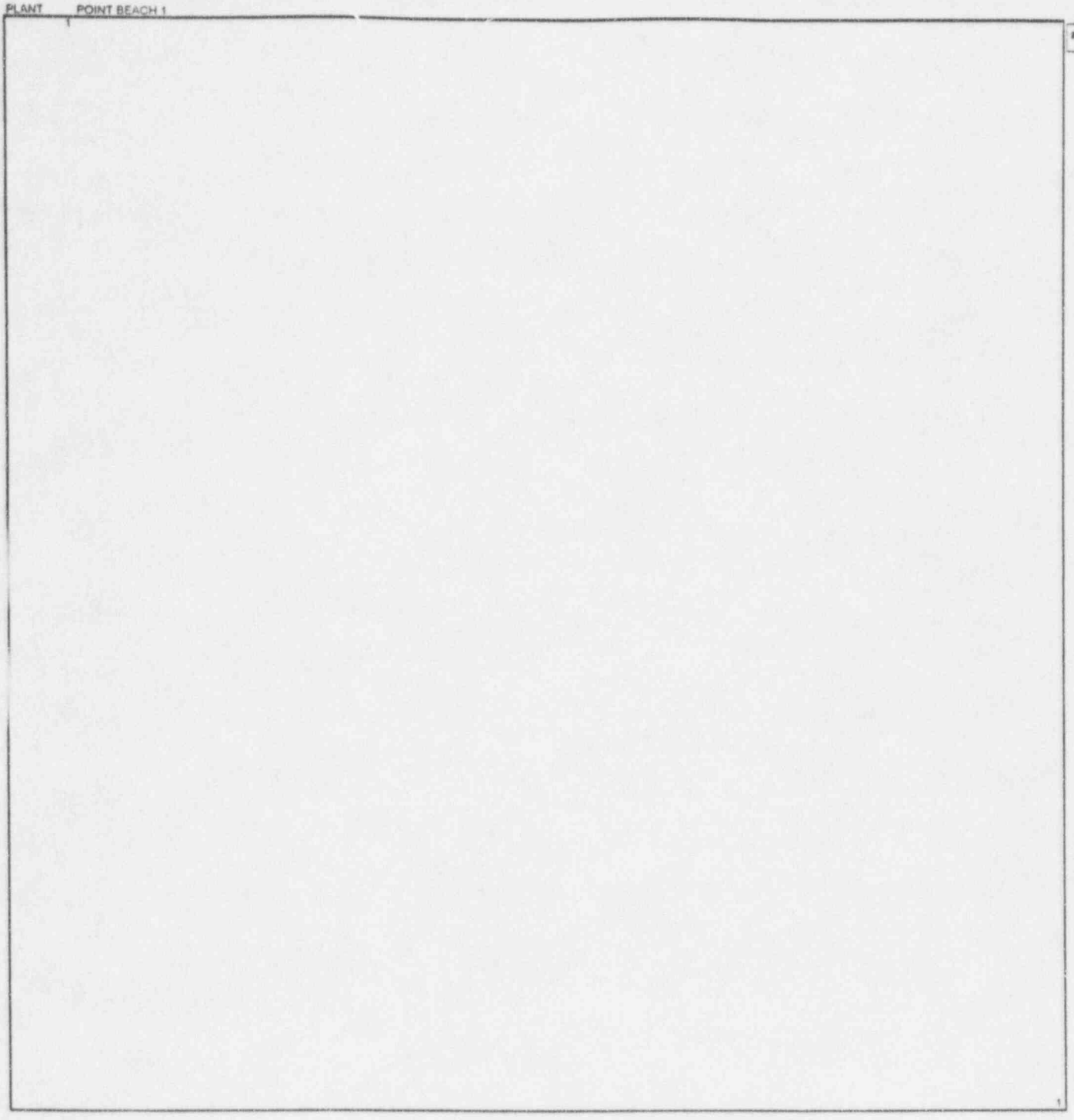
1

PLANT POINT BEACH 1

A, D, C

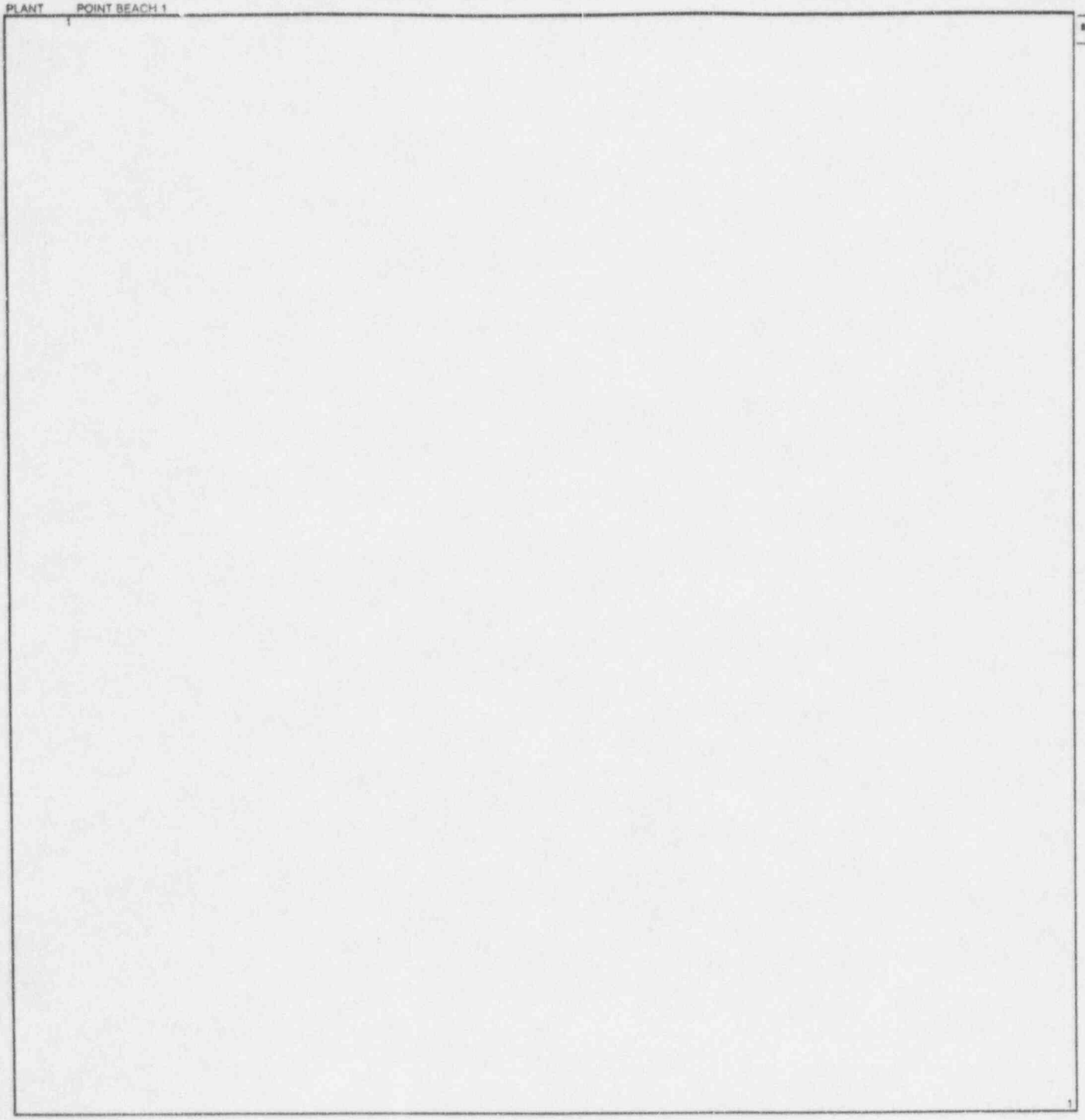
PLANT POINT BEACH 1

A, D, C

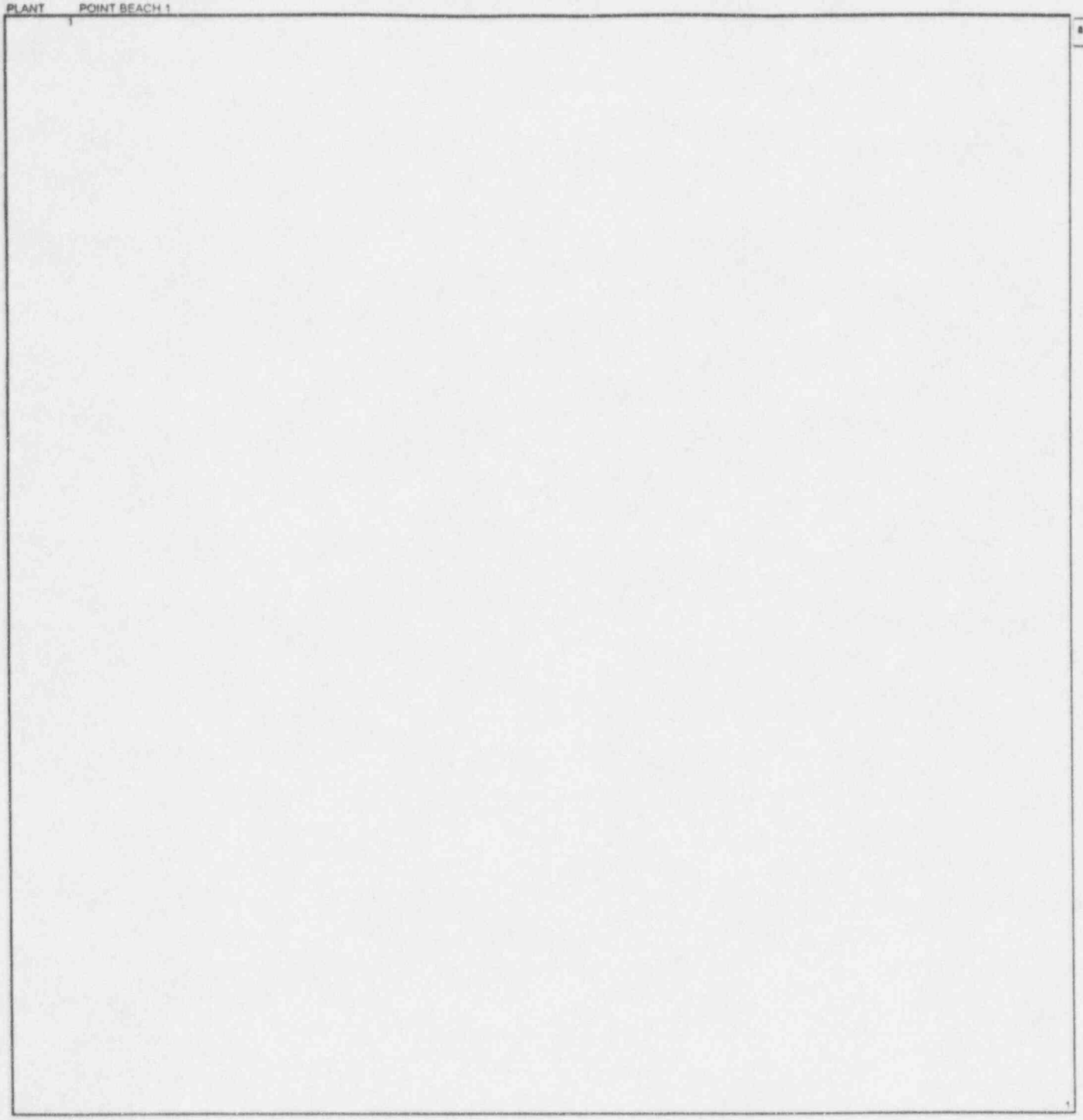


PLANT POINT BEACH 1

B. D. C



PLANT POINT BEACH 1

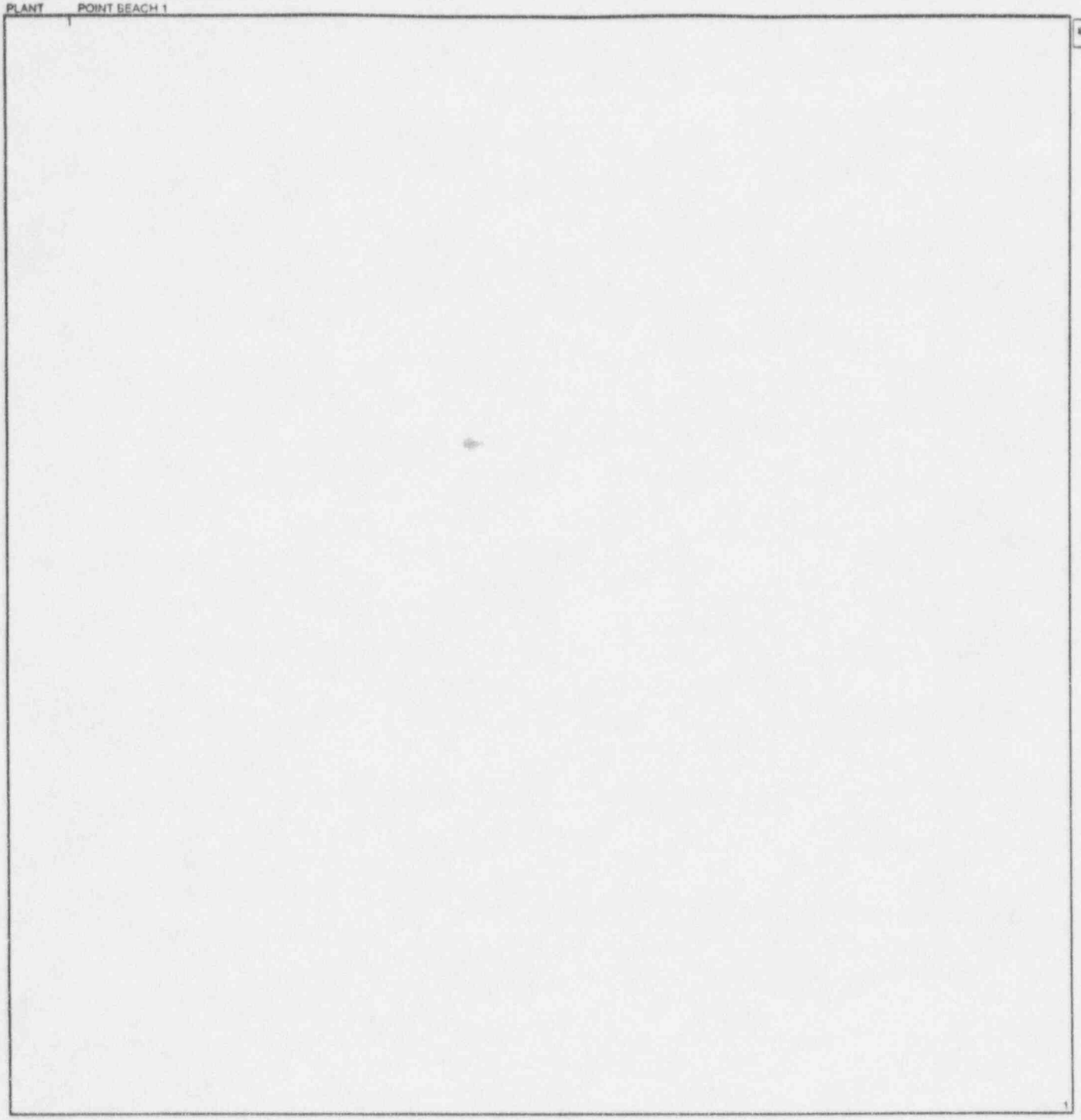


PLANT POINT BEACH 1

B. D. C

1

PLANT POINT BEACH 1



PLANT POINT BEACH 1

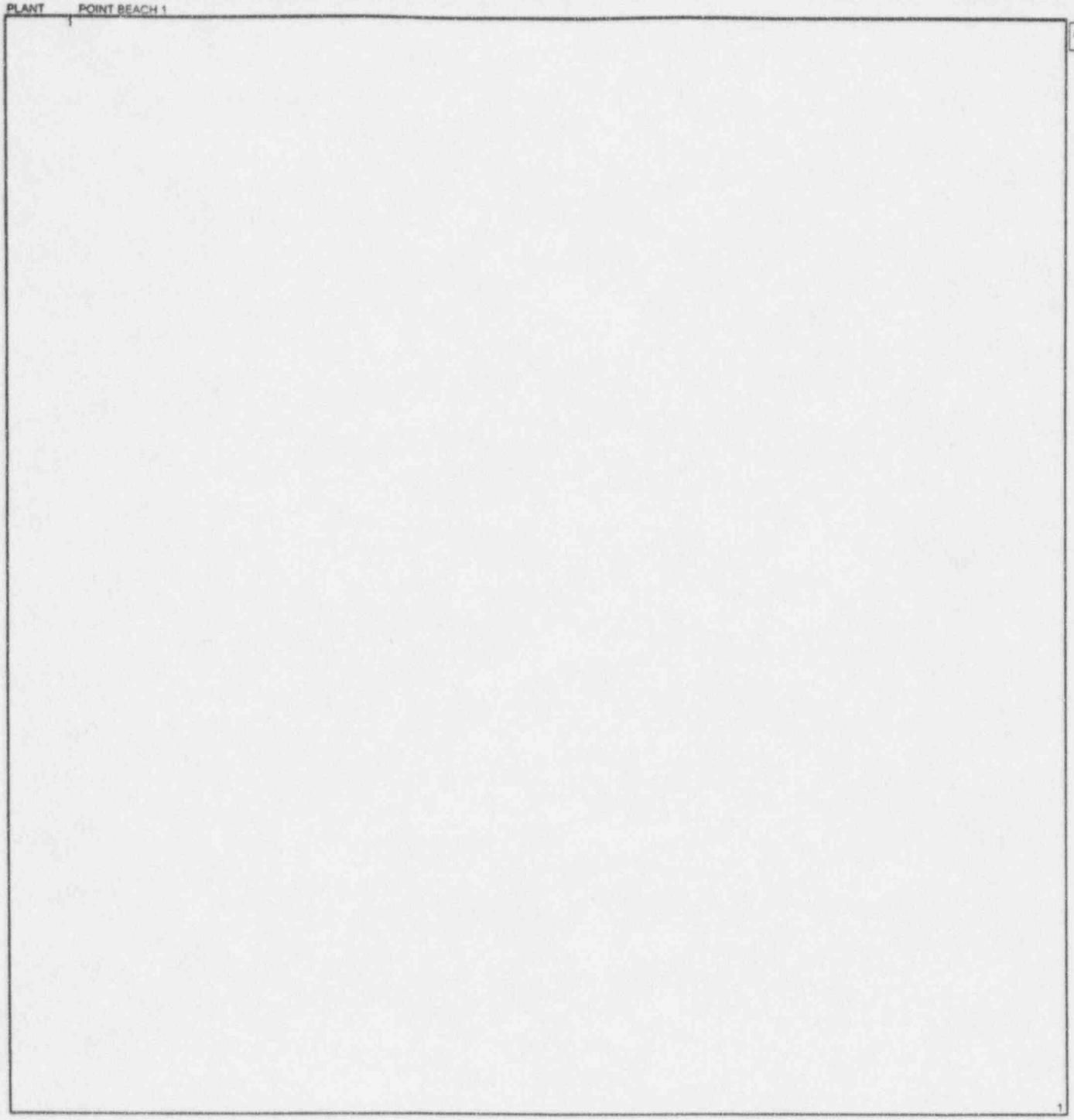
1

a, b, c

1

PLANT POINT BEACH 1

a, b, c



1