

Surry Unit 1/Unit 2 Fuel Assembly Inspection Program

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Inspection work was conducted at Surry by an NSD crew under the supervision of PPE engineer Howard Pendley. 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:

<u>Inspection Program Section</u>	<u>Originating Engineer</u>	<u>Verifying Engineer</u>
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	D. Colburn	J. Halligan
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

Signatures On File

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1.0 Background and Objectives

RCCA insertion anomalies were recently experienced at Wolf Creek and South Texas. During SCRAMs, several RCCAs failed to fully insert. Wolf Creek and South Texas conducted drop tests after their anomalies, and four additional RCCAs did not fully insert. A subsequent inspection program concluded that the direct cause of the incomplete RCCA

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 (F/A) 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 six different contracts were drag tested in the spent fuel pool. The specific fuel features for each assembly are shown in Table 2.1. Most of the assemblies share the following common features:

- High Burnup
- Removable Top Nozzle
- Debris Filter Bottom Nozzle

Table 2.1: Fuel Features of Surry 15x15 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 3 cycles. No distinction could be established for assemblies based on discharge time.

Two assemblies from region VPIF (0F3 and 0F6), standard design, were drag tested as part ^{a, b, c}

The burnup values in Table 2.2 were obtained from Virginia Power Company's June 13, 1996 response to NRC Bulletin 96-01 (Reference 2). Averaged RCCA drag values (withdrawal & insertion) were reported in that letter. Small differences exist between the values reported in that letter and the values reported in this memo. These differences appear to be a function of drag trace interpretation, and they have no impact on the conclusions reached.

Data from two different test agendas is shown in Figures 2.1, 2.2, and 2.3. Reactor trip testing was performed in response to NRC Bulletin 96-01. The spent fuel pool testing was performed to aid in determining the root cause behind the RCCA insertion problem. ^{a, b, c}

Table 2.2: Surry Drag Test Data

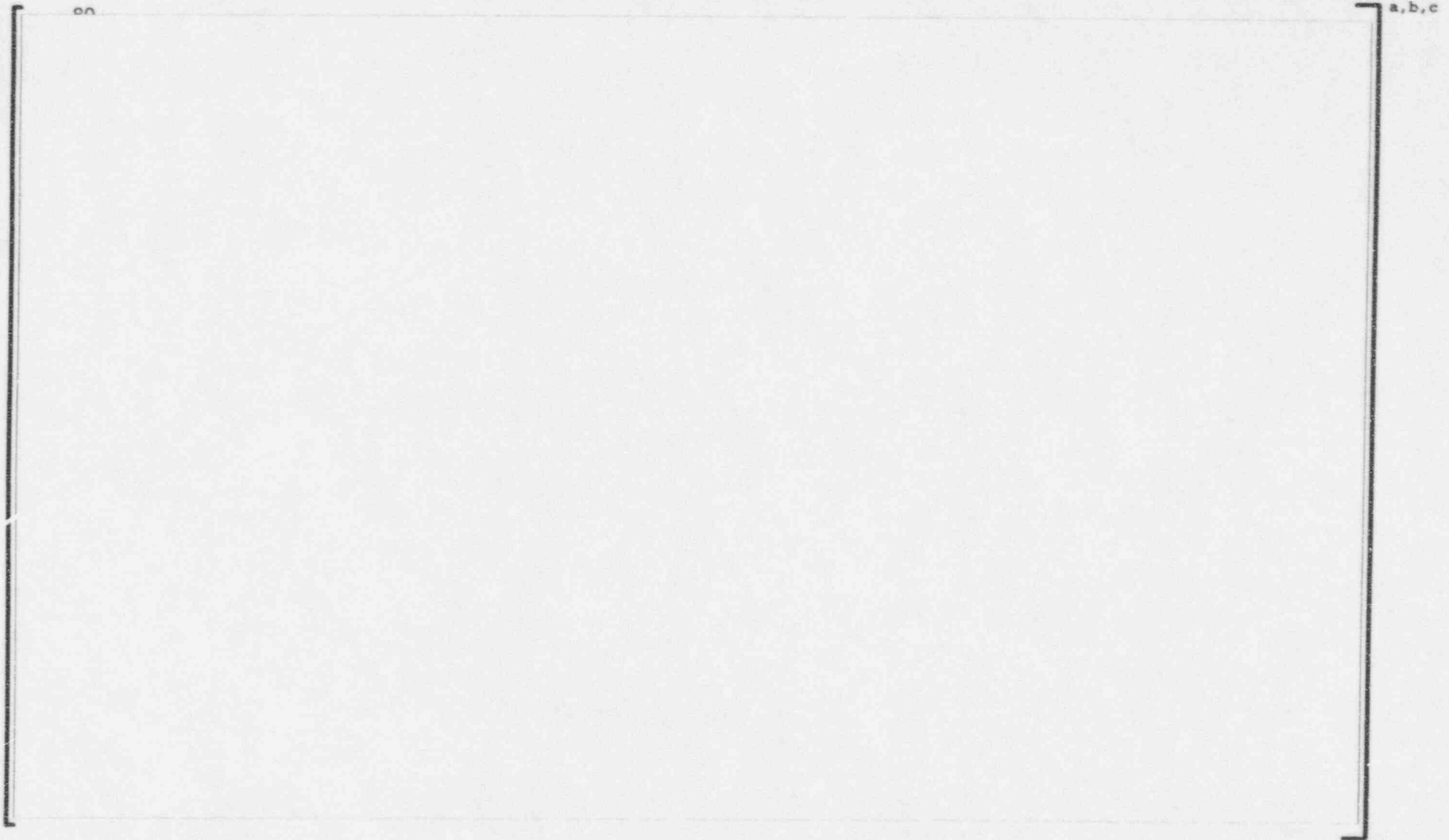
a, b, c

Table 2.2 (continued): Surry Drag Test Data

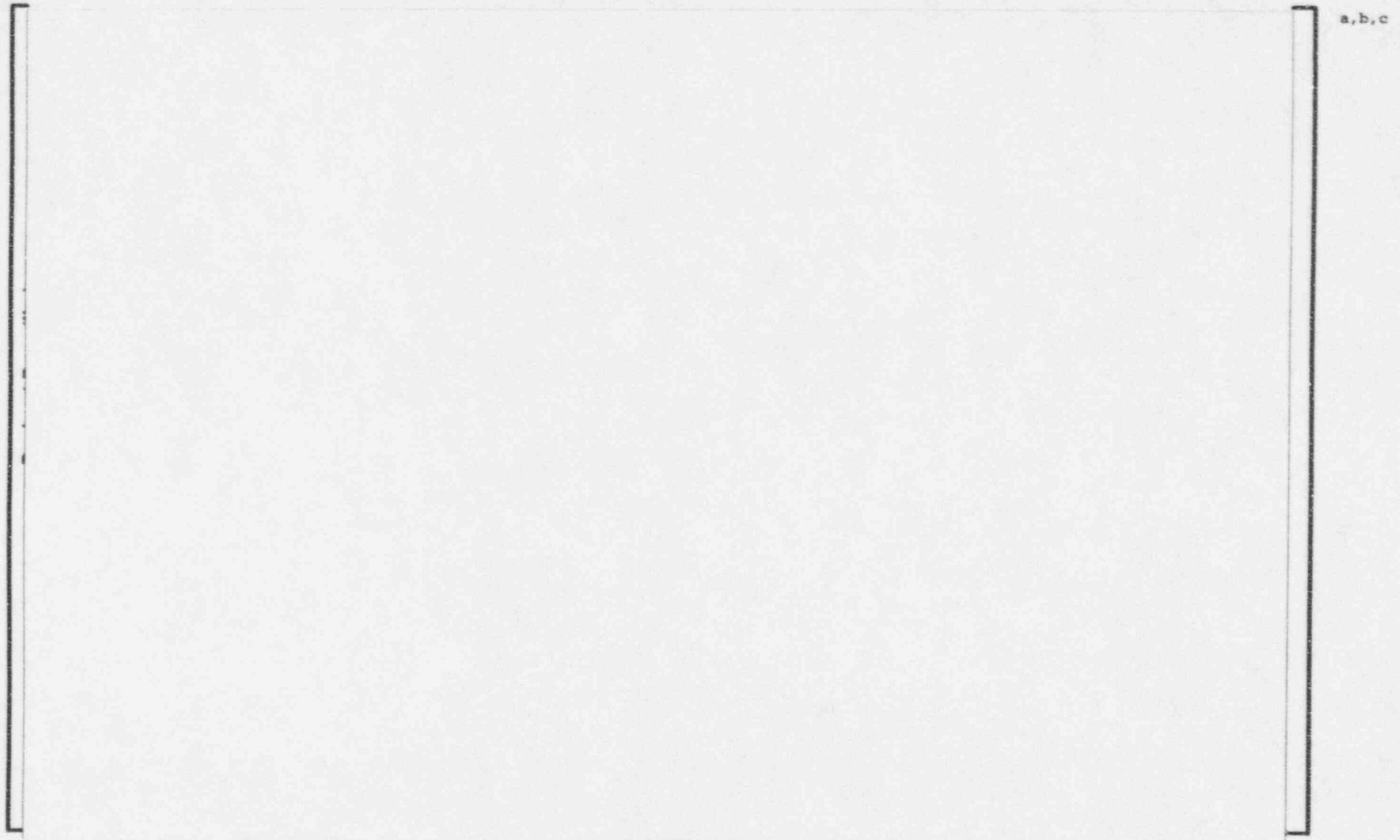
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a, b, c

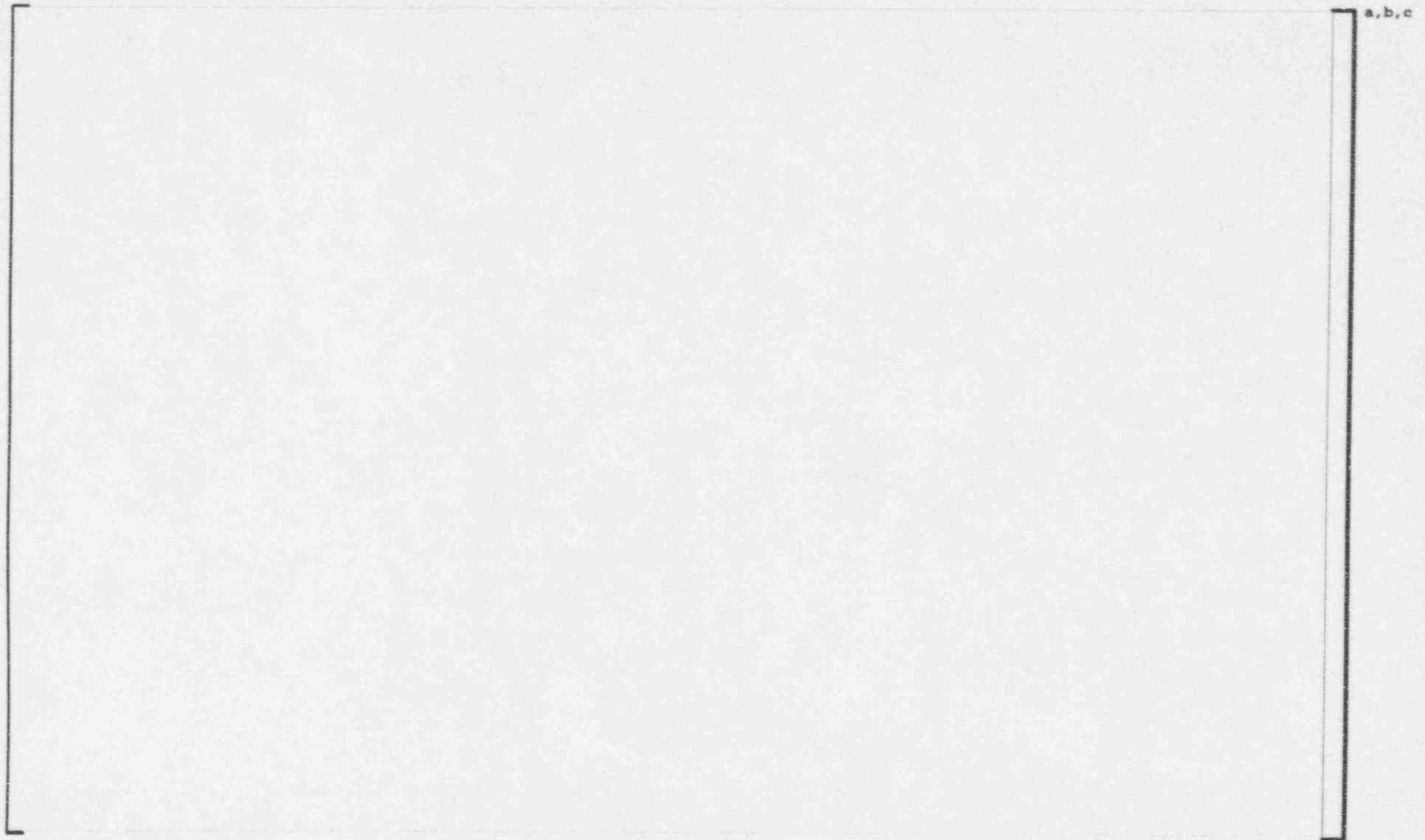
**Figure 2.1: Surry Dashpot and Upper Guide Thimble Drag Data
(Reactor Trip and Spent Fuel Pool Testing)**



**Figure 2.2: Surry Dashpot Drag and Fast Fluence Data
(Reactor Trip and Spent Fuel Pool Testing)**



**Figure 2.3: Surry Upper Guide Thimble Drag and Fast Fluence Data
(Reactor Trip and Spent Fuel Pool Testing)**



3.0 Single Tube Probe

Single tube probing was conducted on four fuel assemblies at Surry. The assemblies were selected based on burnup and drag measurements listed in Table 3.1 below. The probe information was used to establish the extent of susceptibility of 15x15 designs to the insertion anomaly experienced previously at Wolf Creek.

a,b,c

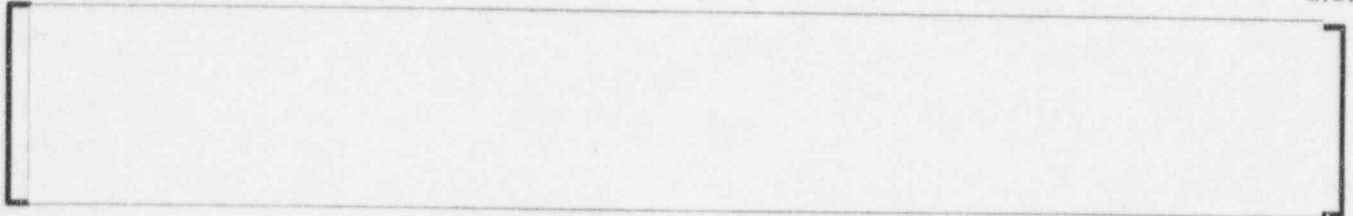
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Table 3.1: Assemblies Tested With Single Tube Probes

a,b,c

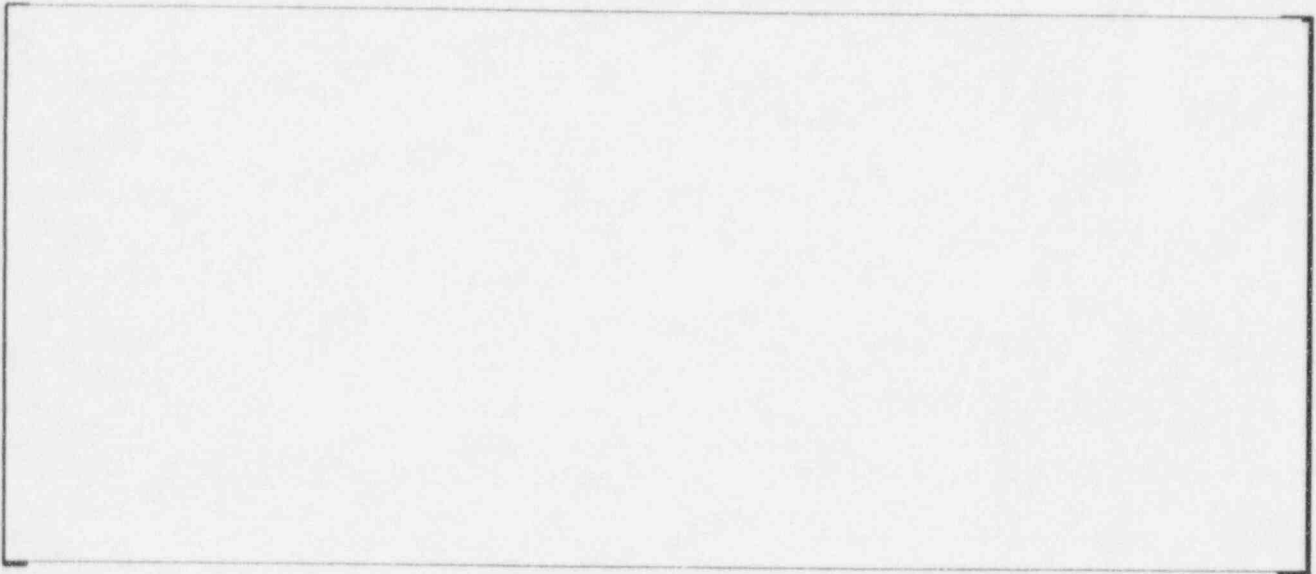
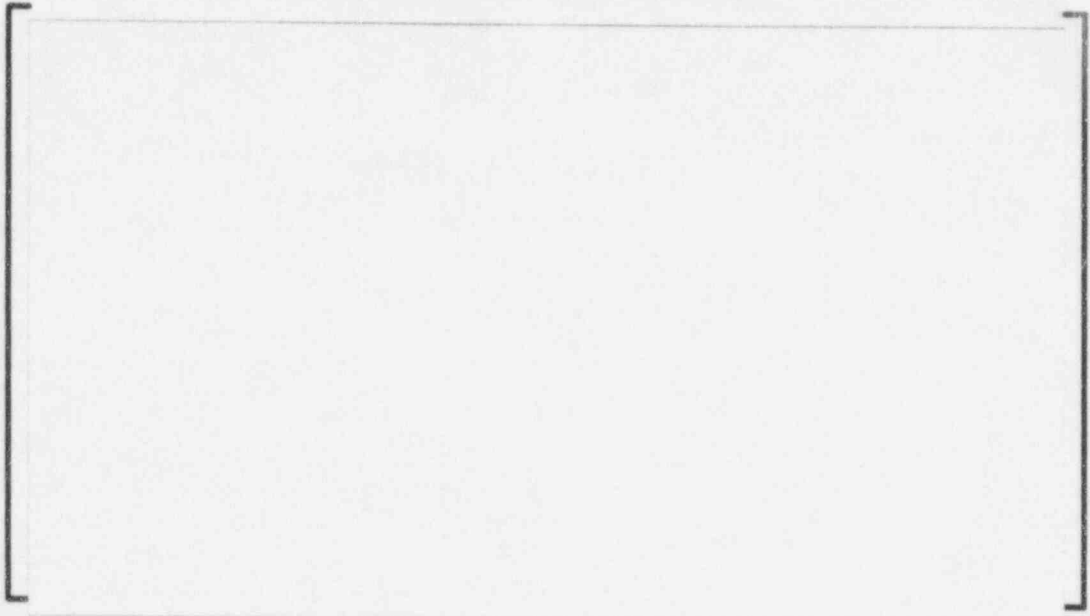
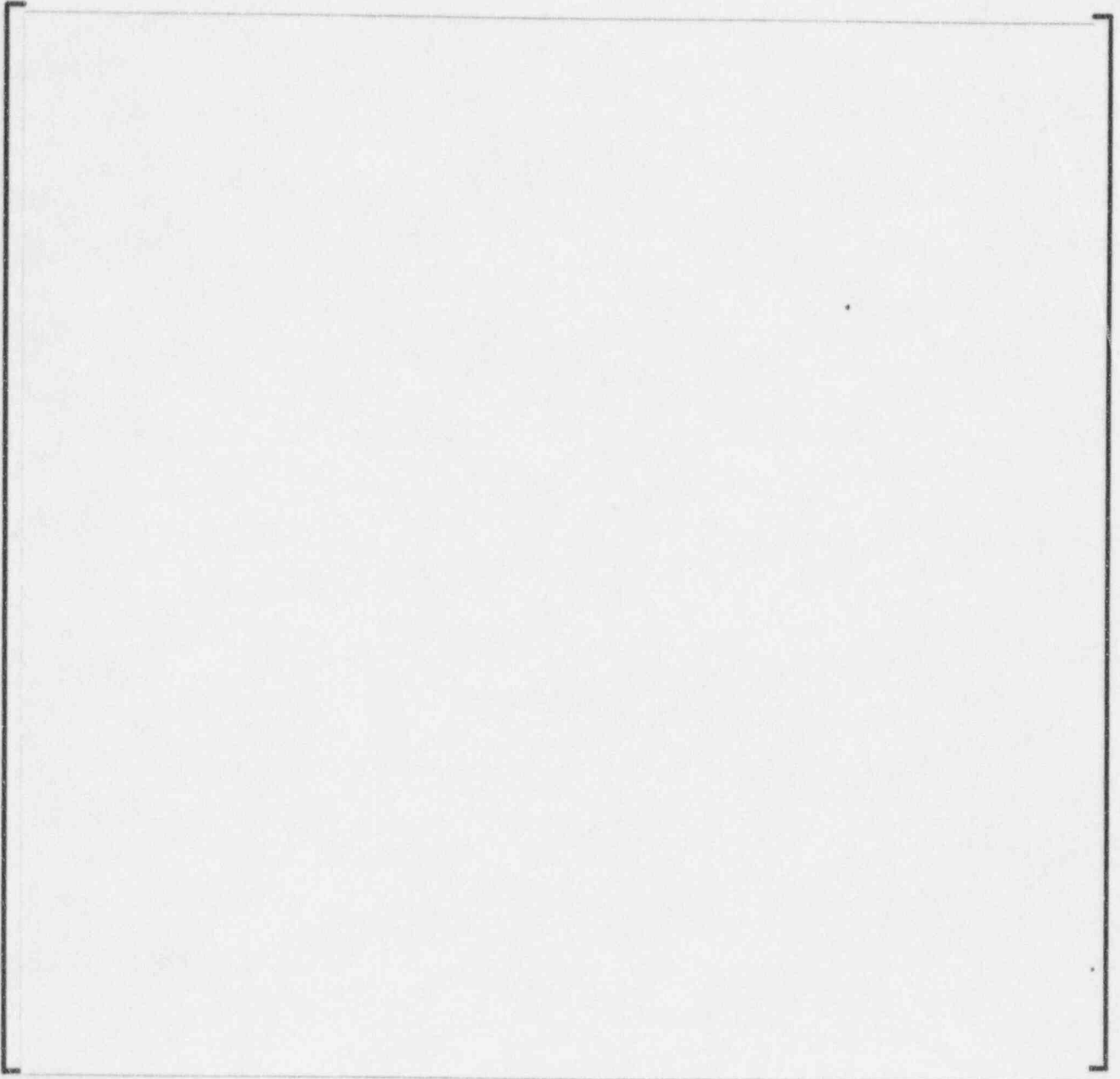
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Table 3.2: Single Tube Probe Test Results

a,b,c

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a, b, c



4.0 Fuel Assembly Growth

a, b, c



Table 4.1: Surry Fuel Assembly Growth Data

a, b, c

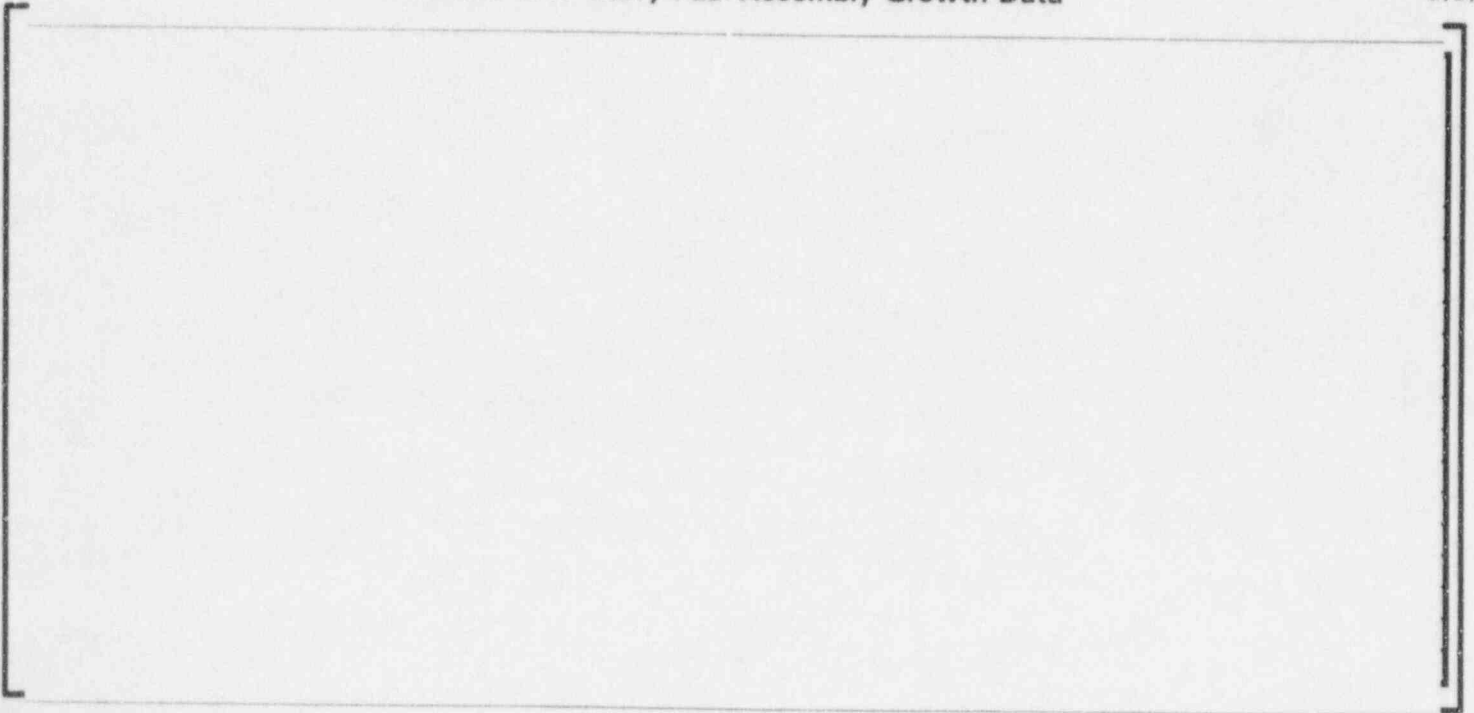


Figure 4.1: Recent Fuel Assembly Growth

a, b, c

5.0 Fuel Rod Growth

a, b, c



Table 5.1: Summary of Surry Assembly Average Rod Growth

a, b, c

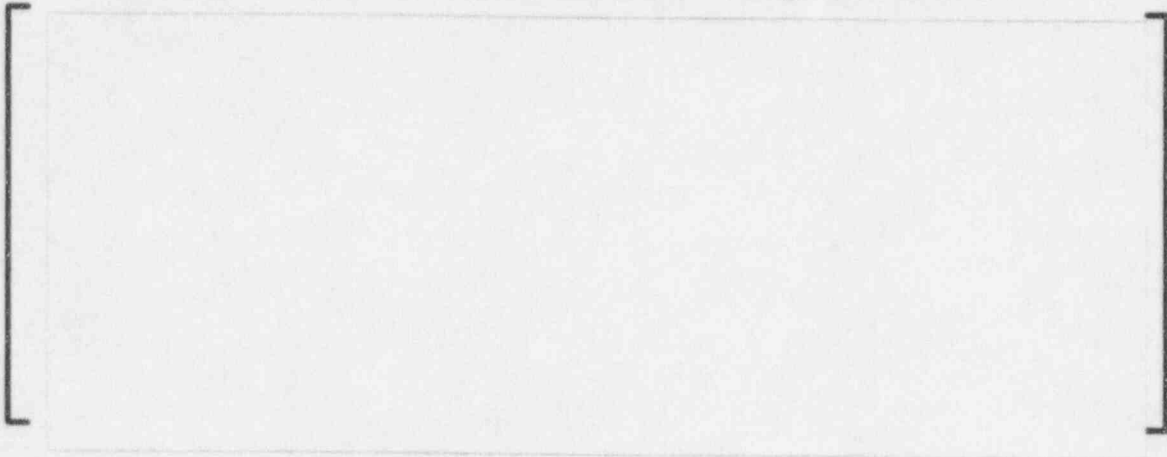
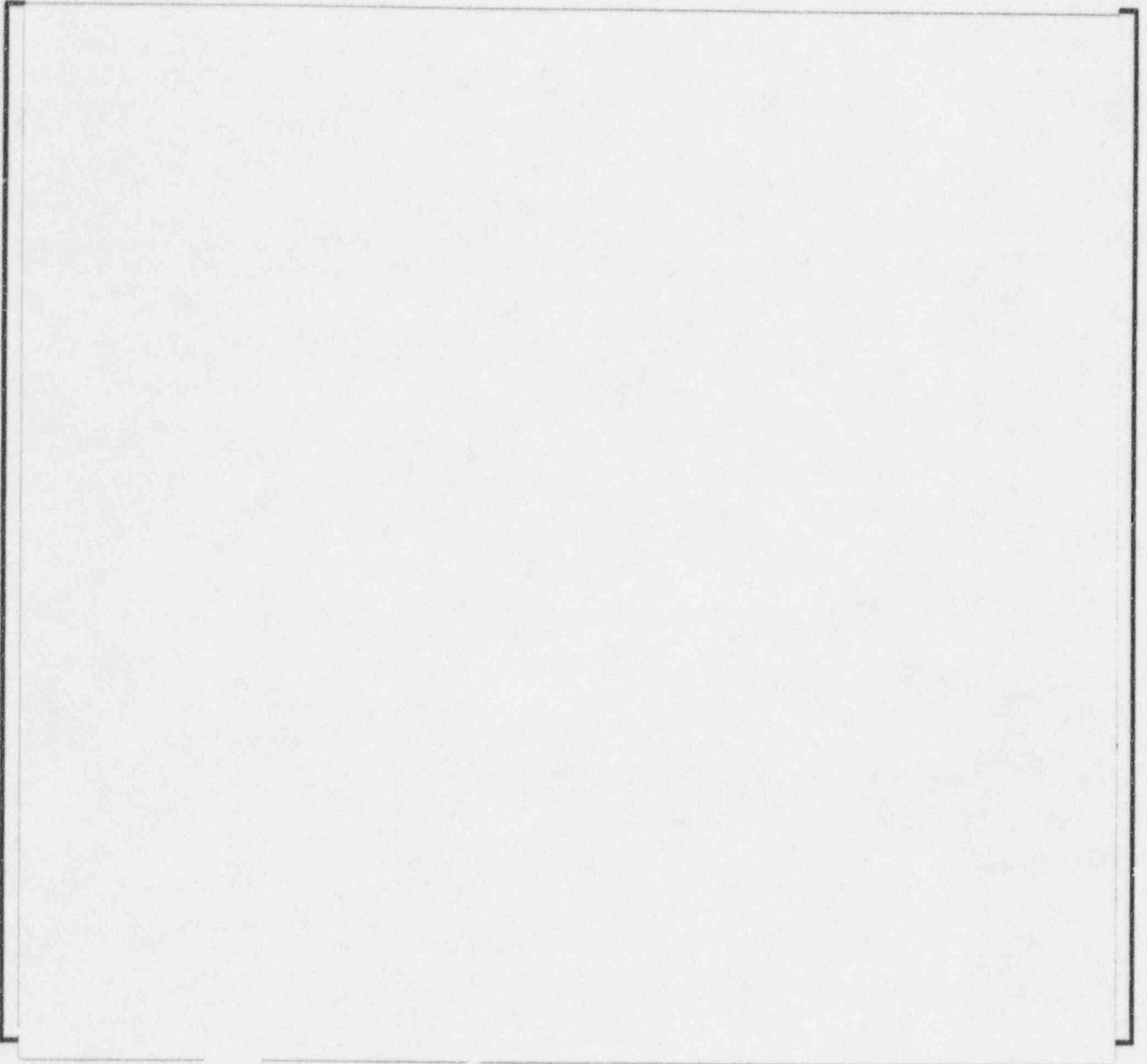


Figure 5.1: Assembly Average Rod Growth Data



6.0 Summary

a, b, c



Appendix A
Fuel Rod Growth Data
for
Surry Units 1 & 2

SURRY 1

A.B.C.

SURRY 1

a.b.c

SURRY 1

a.d.c

SURRY 1

A.D.C.

SURRY 1

a.b.c.