ATTACHMENT 1
ANO-2 CYCLE 1 REFUELING OUTAGE
FUEL EXAMINATION RESULTS

1.0 INTRODUCTION

Arkansas Nuclear One - Unit 2 shut down for its first refueling on March 28, 1981. Fuel shuffling and wet sipping operations on all 177 assemblies commenced on April 19 and were completed on May 1, 1981. Seven leaking assemblies were identified. Five of these that were scheduled for cycle 2 use were reconstituted using fuel rods from a discharged Batch "A" assembly. The reconstituted assemblies were then re-sipped and found to be leak free. A summary of the reconstitution effort, including the results of most of the fuel inspections, was reported in CEN-164(A)-P dated May 18, 1981. At that time, it was noted that further fuel examinations would be undertaken to diagnose the causes of the fuel rod failures. The examinations are now complete and the conclusions can be summarized. For coherency and completeness, some of the CEN-164(A)-P report data is repeated.

2.0 EXAMINATION OF LEAKING ASSEMBLIES

The conditions of the leaking assemblies and the reconstitution actions are summarized in Table I. The locations of the leaking assemblies are presented in Figure 1.

TABLE I

ASSEMBLY CONDITION AND RECONSTITUTION

Assembly	Av. Burnup (MWD/MTU)	No. of Perforated Rods	No. of Replaced Rods a/
B036 b/	14500	1	[ ]
A037	14090	1 e/	Not Reconstituted
B102	13680	1	[
B045 c/	13800	3	]
A017	13520	2 e/	Not Reconstituted
C203	10480	1	[
C308 c/	9580	9 d/	]
	TOTAL	18	TOTAL 66

a/ Fuel rods replaced with sound fuel rods from assembly A006 with Av. burnup of 12,600 MWD/MTU. Additional rods were removed for diagnostic examinations.

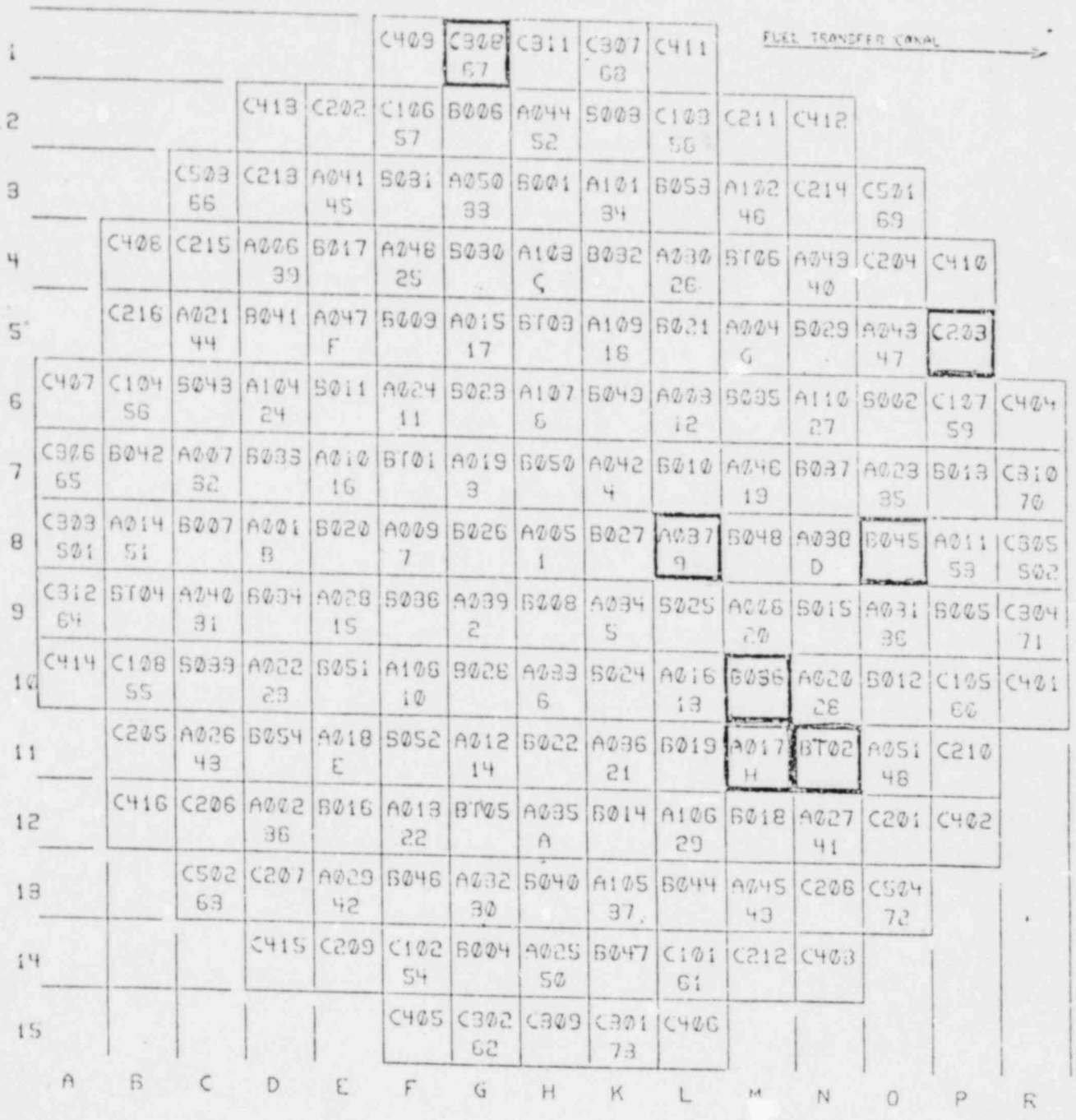
b/ Assembly received new upper end fitting.

c/ Assembly re-caged with new lower end fittings, guide tubes and spacer grids.

d/ 8 perforated fuel rods and 1 possible perforated corner poison rod. The poison rod was replaced with a solid Zircaloy rod.

e/ Estimated from visual examination of intact assemblies. These assemblies were not disassembled.

FIGURE 1
ANO-2 CYCLE 1



Leaking Assemblies in Heavy Outline

3.0 DIAGNOSTIC PROGRAM RESULTS

Combustion Engineering carried out a diagnostic program[1] that included: visual examinations of the seven leaking assemblies as well as [ ] B and C fuel rods removed for this purpose from leaking assemblies, profilometry of fuel rods, length measurements of fuel rods, eddy-current examinations of fuel rods, examination of fabrication records, and a review of reactor operating history. The results from these examinations provided no evidence that could be linked with the failures of fuel rods in reconstituted assemblies B036, BT02 and C308. This encompasses a total of ten fuel rods (8 rods in C308 alone).

The observations and conclusions for each leaking assembly are summarized in Table II.

The maximum assembly bow value cited in CEN-164(A)-P was [ ]. This should be updated. When all the measurements were concluded, the maximum bow value recorded for an annealed guide tube bundle was [ ] and the maximum for a cold-worked guide tube bundle was [ ].

[1]Measurements on oxide thickness, channel closure, fuel assembly bow, and guide tube growth were also carried out in conjunction with the EPRI/CE surveillance program. However, these results did not contribute toward an explanation of the fuel failures.

TABLE II

PERFORATED ROD OBSERVATIONS

Assembly	Observations
B036	One perforated interior rod.
A037	High interior rod (1" higher than others) found by visual exam - [ ].
BT02	One perforated interior rod.
B045	Perforations caused by foreign material trapped below bottom Inconel grid.
A017	Visual exam showed perforations on 2 adjacent, peripheral rods.
C203	Perforation of fuel rod caused by fretting from foreign material trapped below Inconel grid.
C308	[ ]

4.0 CONCLUSIONS

A. The fuel rod perforations in assemblies C203 and B045 were due to fretting induced by foreign material trapped below the bottom Inconel grid. Total of 4 rods.

B. Despite further examinations and diagnostic work, the causes of the rod failures in the remaining five assemblies remains unknown. Total of 13 fuel rods.

In the meantime, the status of fuel integrity in cycle 2, as may be inferred from primary system iodine activity levels, remains unchanged from the stable condition reported in the reference letter to the NRC.

Reference:

D. C. Trimble to Robert A. Clark, Docket No. 50-368, Letter No. 2CAN118106, dated November 25, 1981.