

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To | J. B. ANDREWS

From CORE CONDITION TASK FORCE

Cust.

File No.
or Ref.

Subj. ESTIMATE OF LOOSE CORE DEBRIS VOLUME (4/9/79 - 2000)

Date TIME:
APRIL 9, 1979

SDS 662.1

This letter is cover and customer and not subject only.

ATTACHED IS AN ESTIMATE OF THE AMOUNT OF DEBRIS AVAILABLE FOR CORE BLOCKAGE AND ITS POTENTIAL DISTRIBUTION. THIS IS TO AID IN THE OVERALL ASSESSMENT OF CORE BLOCKAGE.

MOST OF THE INFORMATION IN FORMING THIS ASSESSMENT IS STILL PRELIMINARY AND IS BASED ON OUR BEST ESTIMATE OF CORE DAMAGE.

CC: P. HENNINGSON
CORE CONDITION TASK FORCE
J. S. TULENKO

ATTACHMENT

POOR ORIGINAL

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CORE BLOCKAGE ESTIMATE

BELOW IS AN ESTIMATE OF THE LOOSE MATERIAL AVAILABLE TO CONTRIBUTE TO CORE BLOCKAGE.

1. ASSUME 30% OF TOTAL Zr CORE INVENTORY IS OXIDIZED PRODUCING ZrO_2

45,000 LB TOTAL FUEL CLAD INVENTORY

7,900 LB OTHER Zr INVENTORY

52,900 LB TOTAL

- 15870 LB OF Zr IS OXIDIZED WITH A 1.6 BULK VOLUME INCREASE, FORMING 63 FT³ OF ZrO_2 .

2. THE TOP 30% (46 IN.) OF THE CLAD OXIDIZES EXPOSING 41' OF UO_2 TO THE COOLANT.

- TOTAL UO_2 EXPOSED IS 57,400 LBS OR 94 FT³.
- ASSUME AN ADDITIONAL 10 FT³ OF MATERIAL IS EXPOSED FROM FUEL ROD (SPRINGS, END PLUGS, ETC.).

3. BASED ON THE ABOVE THE EXPOSED MATERIAL AVAILABLE FOR CORE BLOCKAGE IS:

ZrO_2	63 FT ³
UO_2	94 FT ³
OTHER	<u>10 FT³</u>
	167 FT ³

4. OF THIS, SOME IS CAPABLE OF BEING MOVED BY FLOW

	VOLUME FT ³		
	AVAILABLE	MOBILE	IMMOBILE
ZrO_2	63	45 (FLAKES & DUST)	18 LARGER FLAKES OR ON RODS
UO_2	94	14 (<1/16" SIZE)	80 (>1/16")
OTHER	<u>10</u>	----	<u>10</u>
	167	59	108

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THE SMALLER PARTICLES MAY EXIT AND MOVE WITH THE FLOW AND MAY RE-DEPOSIT IN THE CORE OR SETTLE OUT ELSEWHERE IN THE SYSTEM.

EQUIVALENT FLOW BLOCKAGE

- ASSUME THE EQUIVALENT CORE FLOW AREA (10.6 FT DIA), IS 88 FT^2
- TOTAL EQUIVALENT DEPTH OF BLOCKAGE IS $\frac{167}{88} = 1.90 \text{ FT}$ ASSUMING SOLID MATERIAL
- ASSUME 1.5 VOLUME INCREASE FOR PACKING, THEN THE EQUIVALENT TOTAL DEPTH IS $1.90 \times 1.5 = 2.85 \text{ FT}$
- IT IS EXPECTED THAT THE DAMAGE WILL BE GREATER AT THE CENTER THAN AT THE CORE PERIPHERY (SEE NEXT SECTION).

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CORE DAMAGE DISTRIBUTION

THE CORE DAMAGE WILL BE MORE SEVERE IN THE CENTER OF THE CORE THAN ON THE PERIPHERY. THIS RESULTS FROM THE CORE DECAY HEAT POWER DISTRIBUTION WHICH CLOSELY FOLLOWS THE CORE POWER DISTRIBUTION PRIOR TO SHUTDOWN (SEE FIG. 1). THIS WILL RESULT IN CORE DAMAGE DISTRIBUTION AS SHOWN IN FIGURE 2. THE FUEL RODS IN PERIPHERAL ASSEMBLIES MAY BE RELATIVELY INTACT WHILE THE CENTER ASSEMBLY IS PROBABLY SEVERELY DAMAGED, POSSIBLY TO THE CENTER OF THE CORE. THE CENTER ASSEMBLIES MAY HAVE VIRTUALLY NO RECOGNIZABLE ARRAY IN THE UPPERMOST GRID SPANS.

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Fig. 1

CLASS V2.1 CREATED 12/26/73 - INSTR. 60 - 93/2777 - CASE 11 (6,8,32) TIME FLIGHT 79.6570 203.5710 251

	9	10	11	12	13	14	15
①	1.227	1.295	1.417	1.615	1.765	1.875	1.910
②	1.231	1.350	1.496	1.682	1.853	1.977	1.996
③	1.260	1.422	1.577	1.775	1.955	2.117	2.152
④	1.275	1.457	1.635	1.845	2.035	2.197	2.232
⑤	1.276	1.452	1.654	1.885	2.117	2.281	2.316
⑥	1.275	1.457	1.635	1.845	2.035	2.197	2.232
⑦	1.275	1.457	1.635	1.845	2.035	2.197	2.232

group RPD at Day's

1 1.45 1

2 1.23 28

3 1.09 88

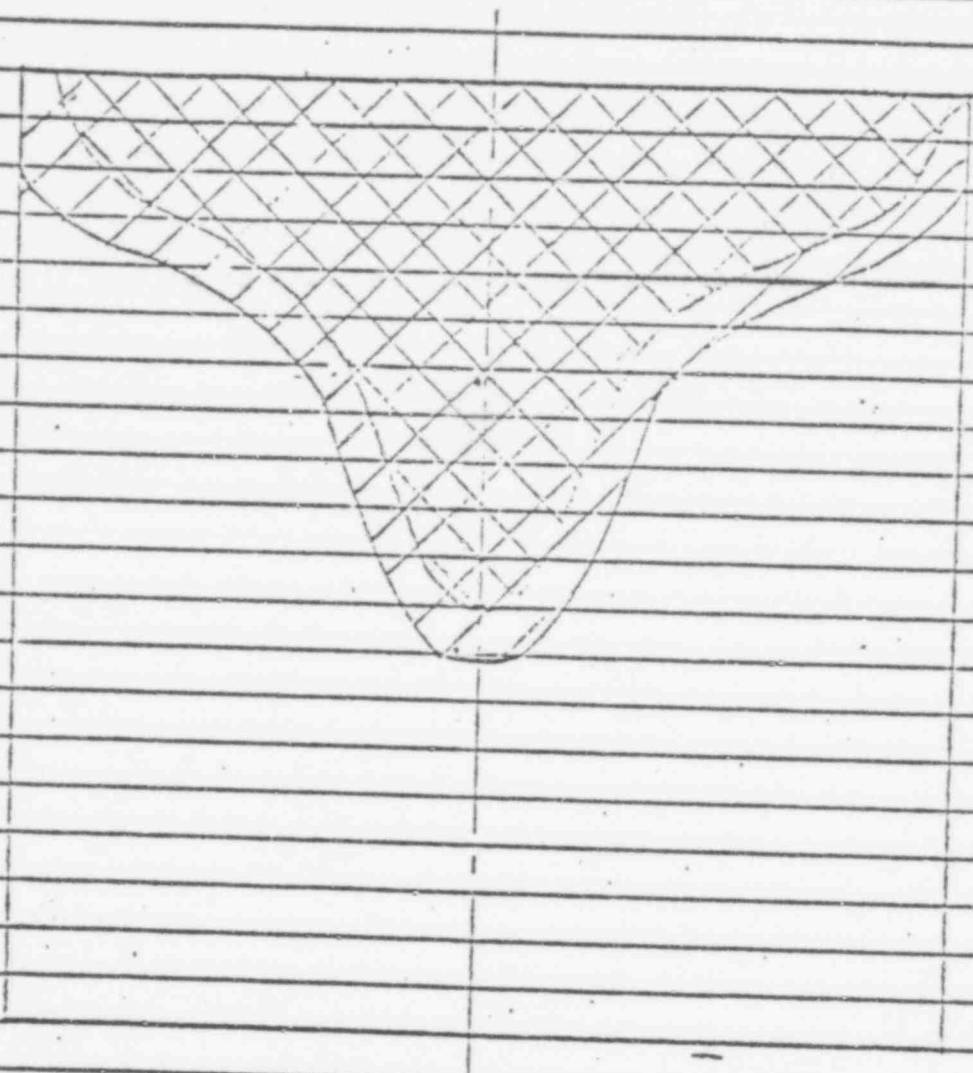
4 .26 90

5 .57 20

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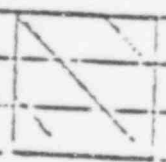
Fig. 2
Core Damage Distribution



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Slightly Damaged



Moderately Damaged

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