MASTER

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WESTINGHOUSE ASTRONUCLEAR LABORATORY

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This is a memo to summarize tests which have been conducted to date on the NRX A-1 regular core support blocks. The test set-up and tested specimens will not be described here but can be observed in Building 8, Engineering Mechanics Test Laboratory. The top, bottom and lateral loading of the support block were all simulated as indicated later.

The various tests are individually summarized on the following pages. From these tests it may be concluded that:

1. The pyrolytic cup and washer will fail before the support block.
2. Only the support block cup seat crushes out when graphite cup and washer is used.
3. The pyrolytic tube inside the support block strengthens the block.
4. When an aluminum cup and washer are used, the 1-1/2 inch support block fails in the neighborhood of 3200 lbs.
5. When an aluminum cup and washer are used, the 2 inch support block cracks apart at about 3800 lbs.

Confidential photographs available upon request.

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attachment

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Test No.	Support Block	State	Type Cup & Washer	Pyro-tube Used	Failure of	Total Load, lbs.	Remarks
1-a.	1-1/2 inch	Virgin	ZTA Graphite	No	ZTA Cup & Washer	1600	No damage of support block.
-b.	Continued		Aluminum		S. Block	2475	Loaded with plate-cracked block.
2-a.	1-1/2	Virgin	Pyrolytic	No	Cup & S.B. Seat	1825	Washed undamaged.
-b.	Continued				Seat	1710	Further crushing of S.B. Cup Seat.
3-a.	1-1/2	Virgin	ZTA	Yes	Cup & Washer	1250	No damage to tube or S.B.
-b.	Continued				Cup & Washer	1375	Completely crushed cup and washer.
4	1-1/2	Prior Tested	Aluminum	Yes	S.B. Cup Seat	3400	Conical section of seat crushed
5	1-1/2	Virgin	Pyrolytic	No	Cup, Washer, S.B. Seat	1750	Mic. readings showed no lateral deflections of S. Block.
-2- 6-a.	1-1/2	Prior Tested	ZTA Cup & Pyro Washer	Yes	Cup & S.B. Seat	1565	Washer undamaged
-b.	Continued				Pyro-Tube	2150	Tube crushed due to failure of cup & seat.
7	1-1/2	Prior Tested	ZTA Cup 30° ATJ Insert	Yes	ZTA Cup & ATJ Insert	1060	No damage to support block.
8	1-1/2	Virgin	Pyrolytic	Yes	Cup, tube & S.B. Seat	1860	Completely phototype test, washer undamaged.
9-a.	1-1/2	Prior Tested	ZTA Cup, ZTA 45° Insert, Pyro Washer	Yes	Cup	1380	
-b.	Continued				Cup, Washer, Tube	1880	Insert & S.Block undamaged
10	1-1/2	Prior Tested	Special ZTA 45° Cup & Washer	Yes	Special Cup & Washer	1585	S. Block & Pyro-tube undamaged
11	1-1/2	Prior Tested	Special 45° ZTA Insert	Yes	Insert & Tube	2075	Support Block undamaged.

Test No.	Support Block	State	Type Cup & Washer	Pyro-tube Used	Failure of	Total Load, lbs.	Remarks
12	1-1/2	Prior Tested	Special 60° ZTA Insert	Yes	Insert & S. Block	1700	Pyro-tube undamaged. S. Block cracked apart.
13	1-1/2	Prior Tested	Aluminum	No	S.Block Seat	2630	} Only difference in Test 13 and 14 is the pyro-tube, shows strengthening effect.
14	1-1/2	Prior Tested	Aluminum	Yes	S.Block Cracked	3220	
15-a.	2	Virgin	Pyrolytic	Yes	Cup	1740	Other things O.K.
-b.	Continued				Crushed cup, washer, tube	2100	S.Block cup seat crushed also.
16	2	Prior Tested	Aluminum	Yes	S. Block	3825	Seat crushed and block cracked apart.

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GENERAL OBSERVATIONS CONCERNING TESTS

1. In Test 1, the support block was failed by loading the seven simulated fuel elements with a flat plate. In the following tests, each simulated fuel element was individually loaded with a hydraulic cylinder. In most tests, a simulated lateral load was used.
2. The first four tests incorporated a cone and ball arrangement while following tests utilized a simulated cone and spherical washer set-up. Both methods were utilized to simulate the effect of the tie rod.
3. Prior tested blocks refer to blocks which had been tested at least once and either were not damaged or the support block cup seat was rebored to provide a new seat.
4. In two tests, a strain gage was attached to the inside of the pyrolytic tube. They indicated that essentially no lateral load was exerted on the tube until the graphite cup and the support block seat had failed.
5. Tests 7, 9, 10, 11, and 12 were conducted at M. J. Manjoine's instructions to test the effect of using tapered support block cup seats. This was done to alleviate crushing of the support block seat. Some increase in load was noticed and the support block itself remained undamaged (except for the 60° taper-test). This did not produce the desired result however.

6. No further tests are to be conducted on 2" regular blocks at this time since graphite cups will merely fail as with the 1-1/2" blocks. Testing will proceed to the 2" irregular support blocks.