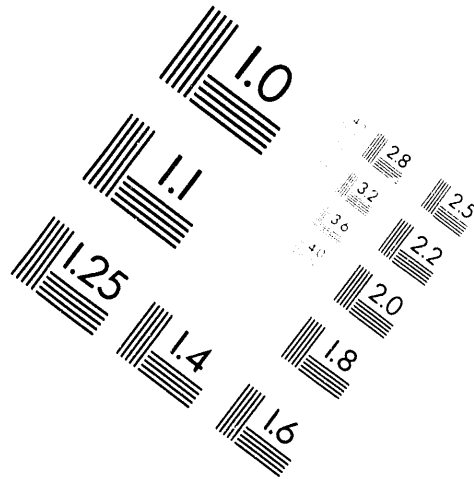
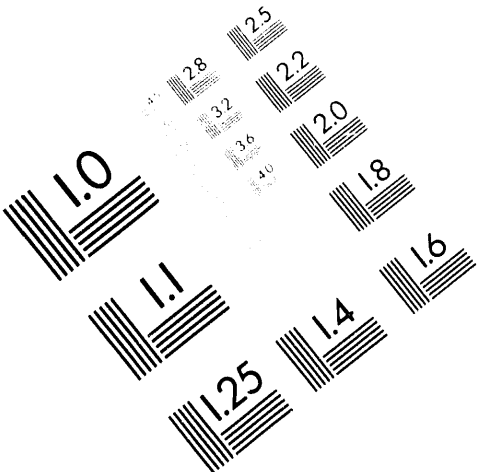




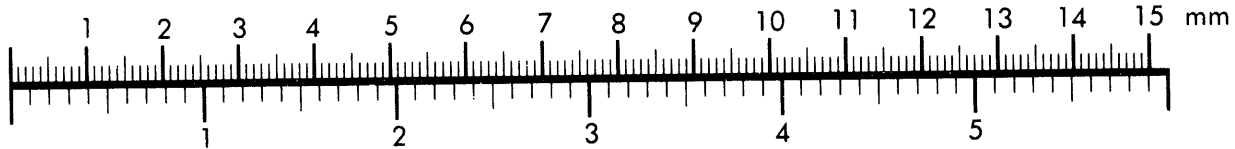
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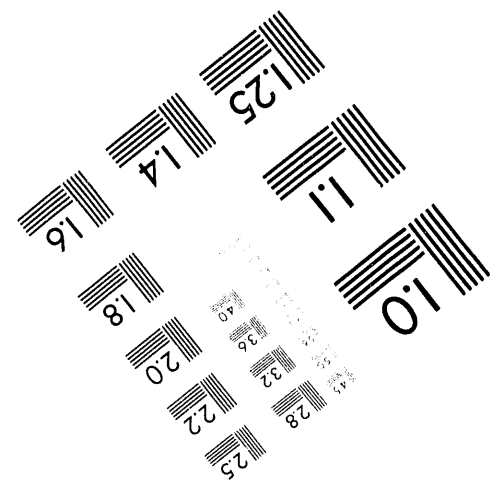
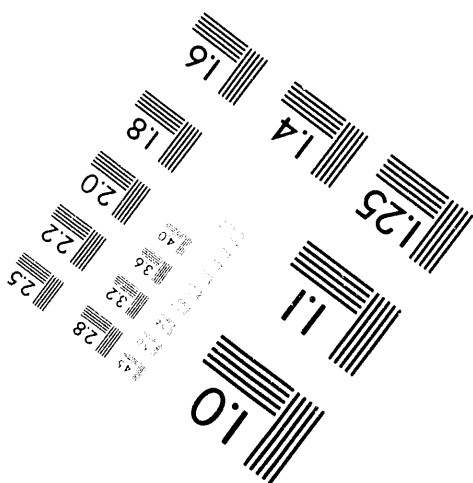
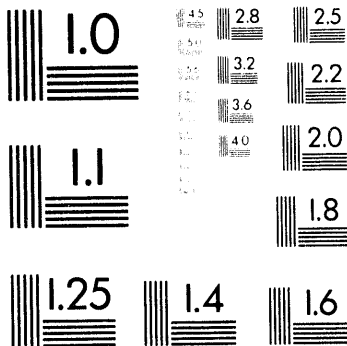
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HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

DATE 7-13-60

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TITLE  
KER-3 Operating Report:  
Test No. K-3-10 -PT-IP 288A  
Test No. K-3-11 -PT-IP-317-A  
PT-IP-315A

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KER-3 LOOP OPERATING REPORT

TESTS K-3-10 AND K-3-11

Test K-3-10

The loop was charged October 30, 1959 according to PT-IP-288A "Evaluation of Seven Rod Cluster Elements With Modified End Closures" with seven 12-inch Natural Uranium Zircaloy-2 clad 7-rod clusters. The test was primarily for the new hot-headed method of end closure used on these elements.

The loop was pressure tested at 4000 psi after it was charged.

Initially the loop was held at low temperature to study the buildup of oxygen (presumably from radiolytic decomposition of water).

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After startup the neutron activity held at slightly above normal but the strainer gamma activity was exceptionally low.

Frequent additions of LiOH bombs were necessary to maintain the pH at 10.0 (previously it was 4-5 pH but was raised to pH 10 for this test.) After the temperature was raised to operating conditions the pH held nicely at 10.

On November 16, 1959, the heat exchanger exit temperature thermocouple blew out resulting in depressurization of the loop and a reactor scram.

Repairs were made during the outage and the loop was returned to normal operation.

Eleven scrams occurred during the test period caused by 105-KE or 1706-KER.

The loop was on single-pass seven times during the test and was being cooled by process water at these times.

The charge was in pile a total of 196 days.

The main loop flow was held at 60 gpm.

The effluent pressure was a constant 1600 psi.

The effluent temperature ranged from 260 C-270 C for a total of 140 days during this period.

The tube delta pressure was approximately 44 psi.

Greater than 40 C of boiling point suppression was maintained at all times.

The loop water was controlled at pH  $10 \pm 2$  by the addition of high pressure LiOH bombs. An alternate or combined flow of 3 to 5 gpm through two ion exchange columns containing XE-154 LiOH based resin containing XE-150 neutral resin respectively, was also used to control the water quality.

The first series of hot crud samples were taken on this test.

The mock-up tube contained samples of A-312 carbon steel, 304 stainless steel, and Zircaloy-2 mounted on rods and had a normal water flow of 14 gpm.

After reaching the desired exposure, the tube was discharged May 14, 1960, using special handling equipment.

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Test K-3-11

The loop was charged on May 14, 1960, with five 6-inch and six 9-inch I & E elements of natural uranium with coextruded 20-mil Zircaloy-2 clad, according to PT-IP-317-A, "Evaluation of Fuel Element Heat Treatment Variables During High Temperature Irradiation In The KER Loops." These elements were held in 18-inch stainless steel sleeves. They had been subjected to different cooling rates through the B-~~o~~ transformation after the heat treatment; the principle purpose of the test was to compare these heat treatments as to warp and bumping. The charge also contained two elements to provide irradiated samples for autoclave rupture studies according to PT-IP-315A, "Irradiation of Zircaloy-2 Jacketed Rod Samples For Out-of-Reactor Failure Testing." One is a 16-inch composite rod containing four samples; the other a nine inch seven rod cluster of which each rod is a composite of two samples. All are natural uranium clad in Zircaloy-2.

Signs of neutron activity developed immediately on startup and increased as the loop temperature was raised. The temperature was reduced to minimum, but neutron activity remained significant. High gamma activity was also present throughout the loop. The temperature was again raised and the neutron activity increased slowly as the temperature increased to 100 C, then rose very rapidly as the temperature was increased to 120 C, sending the neutron monitor off scale, scrambling the reactor and depressurizing the loop. The gamma activity and the readings of the neutron monitors on adjacent loops also went up at this time. Loop water samples were taken and sent to 200 area for radio analysis. Some of the elements in this charge had been externally contaminated with UO<sub>2</sub> during autoclaving, but had been cleaned by scrubbing and HNO<sub>3</sub> pickle before charging. The loop was discharged on May 16, 1960, and charged with dummies.

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Acknowledgment

The author would like to express appreciation for the information provided by the weekly report written by R.J. Lobsinger and D.R. Dickinson and to L.D. Carpenter, Technician CTU, for compiling the data used in this report.

*F.E. Sharp*

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