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Buckling Measurements for Fuel Elements in a Random Array

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Buckling measurements of fuel elements in a random array were continued. Two hundred and twenty-five canned I & E elements of 1.44 per cent enriched uranium were dropped randomly into a tank, which was water filled and reflected on the sides and bottom. The uranium slugs were 1.37 inches O.D. and 0.48 I.D. and eight inches long. The canned dimensions were 1.47 inches O.D., 0.37 inch I.D. and 8.6 inches long. The results of these measurements are given below.

BUCKLINGS OF 1.44 PER CENT I & E SLUGS

<u>Exp. No.</u>	<u>H₂O/U (Volume Ratio)</u>	<u>Buckling (10⁻⁶ cm⁻²)</u>
42*	1.78	3271
43*	1.78	3225
44	1.80	3785
45	1.74	3777
50	1.93	2775

*Measurement made previous quarter

The average buckling is 3367 μ B and the average H₂O/U volume ratio is 1.81. In order to evaluate more fully the decrease in buckling for the random array, the buckling of these canned I & E fuel elements was measured in a uniform distribution. The H₂O/U volume ratio for this case was 1.97, and the measured buckling was 5264 μ B. Before making a comparison of the latter value with that of the random array, corrections must be applied for the differences in the amounts of aluminum (process tubes) and in the H₂O/U volume ratios for these cases. A corrected value for the uniform distribution is about 5850 μ B and this is to be compared with the value of 3367 μ B.

Bucklings were also determined for uniform lattices of alternate rods of 1.00 per cent U^{235} enriched uranium having diameters of 0.925 inch and 1.66 inches. The results of these measurements are given in the following table.

COMPARISON OF COMBINATION AND INDIVIDUAL BUCKLINGS

<u>Exp. No.</u>	<u>Lattice Spacing (inches)</u>	<u>H₂O/U (Volume Ratio)</u>	<u>Buckling of 1.66" Slugs</u>	<u>Buckling of 0.925" Slugs</u>	<u>Buckling for Combination (10⁻⁶ cm⁻²)</u>
46	2.05	1.45	2700	3130	2606
48	2.2	1.84	2230	3440	2078
49	1.95	1.20	2640	2230	2524
68	1.80	0.86	1634	----	1396

The buckling of the combination (fixed randomness of a sort) peaks below the buckling of either of the rod sizes alone. The combination bucklings are slightly less than the 1.66 inch rod bucklings but are higher than the 0.925 inch rod bucklings at lower H₂O/U ratios.