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June 18, 1963

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MASTERRECOMMENDED MWD FACTORS FOR TRITIUM YIELD PREDICTIONSINTRODUCTION

This document is a recommendation to change the MWD factors used by Production Computing Operation, IPD, to calculate Tritium yields from target fuel irradiated in the Hanford Production Reactors. The linear Tritium yield equations in the Nuclear Materials computer programs will not be affected by this change.

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DISCUSSION

Tritium production is calculated by the IBM 7090 computer using a linear equation with a conversion factor based on the best available data from previous recovery experience. The equations currently in use are as follows:/1/

For the Blanket Fuel:

$$T = \frac{0.0177}{0.65} \times Q_1 = 0.0272 \times Q_1 \quad (1)$$

For the Striped Core Fuel:

$$T = \frac{0.00256}{0.0940} \times Q_2 = 0.0272 \times Q_2 \quad (2)$$

where: T = grams of tritium

Q_1 = equivalent MWD of the adjacent enriched fueled tube which is calculated by PCO as 65% of the MWD of the adjacent tube for blanket tubes.

Q_2 = tube MWD x 0.0940. This factor has been used by PCO for programming convenience so that only one factor, 0.0272, is needed in the SSA programs.

The latest measurements of E-N conversion test results/2/ are quoted as follows:

T yield (grams Pu Equiv./MWD)

<u>Core</u>	<u>Blanket</u>
0.199	0.193

After converting the factors listed above to a form which is usable in the SSA Accountability Program the corrected factors are:

For the Blanket Fuel:

$$T \text{ (grams H}_3\text{)} = \frac{0.193 \times 3.02 \times Q_1}{239 \times 0.65 \times 0.138} = 0.0272 \times Q_1$$

For the Core Fuel:

$$T \text{ (grams H}_3\text{)} = \frac{0.199 \times 3.02 \times Q_2}{239 \times 0.0923} = 0.0272 \times Q_2$$

where 3.02 and 239.0 are gram atomic weights of H₃ and Pu 239 respectively.

0.138 per cent of total fringe tube power produced in tubes adjacent to the target fuel.

/1/ HW-69552 - Accountability Equations for Plutonium and Tritium Yields,
W. S. Nechodom, May 10, 1962

/2/ HW-73615, SUP3 - Final Report on E-N Conversion Ratio Data, R.D. Carter and
W. A. Blyckert, December 18, 1962

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Q_2 = tube MWD x .0923. The 0.0923 number should be used by PCO for programming convenience so that only one factor, 0.0272, is needed in the SSA program.

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