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ATOMIC WEAPON DATA

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9. Extra File
10. Extra File
11. 700 File
12. Yellow File

October 3, 1952

This document consists of 10 pages, No. 12 of 12 copies. Series

To: File

From: P.E. Collins - Leader
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Separations Technology Unit
Technical Section
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PURITY DATA ON REDOX START-UP MATERIAL
THROUGH THE 231 AND 234-5 BUILDINGS
# INTRODUCTION

Redox effluent for production was first processed in the 231 Building on February 4, 1952. Samples of process streams were taken after each purification step to evaluate the adequacy of purification processes in the 231 and 234-5 Buildings and to provide close control of this material.

Data regarding pile residence histories, radiation surveys of "Sample Cans", reduction yields, C/Q values, and product purity after purification steps were accumulated and are presented in this report to establish preliminary data which may be used to evaluate future process changes.

# SUMMARY

1. Purity of the product obtained from Redox effluent proved adequate to meet specifications (See Tables V and VI).

2. Purification factors for the major impurities are given below to indicate the magnitude of purification achieved. (Purification factors less than 2 are omitted inasmuch as the spectro-chemical analyses are considered to be accurate within ±2X.

<table>
<thead>
<tr>
<th>Impurity</th>
<th>2 Peroxide Precipitations</th>
<th>1 Oxalate Precipitation</th>
<th>Reduction of PuF₄ to Metal</th>
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</tr>
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</tr>
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<td>Cr</td>
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</tr>
<tr>
<td>Fe</td>
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<tr>
<td>Zn</td>
<td>3</td>
<td>--</td>
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</table>

*Based on Table V
3. The C/Q value for an average of 40 buttons (calculated from B-1 analyses) produced on the RM and RG Lines are as follows:

<table>
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<tr>
<th>Origin</th>
<th>Process Line</th>
<th>Max.</th>
<th>Ave.</th>
<th>Min.</th>
<th>Ave. for Mg</th>
<th>Ave. for others</th>
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</thead>
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<td>S-plant</td>
<td>RM</td>
<td>1.951</td>
<td>0.935</td>
<td>0.435</td>
<td>0.676</td>
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<td>S-plant</td>
<td>RG</td>
<td>1.711</td>
<td>0.794</td>
<td>0.252</td>
<td>0.591</td>
<td>0.203</td>
</tr>
<tr>
<td>T-plant</td>
<td>RG</td>
<td>0.981</td>
<td>0.540</td>
<td>0.276</td>
<td>0.338</td>
<td>0.202</td>
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</table>

The average C/Q value for magnesium is included to indicate that the major portion of the C/Q value is due to Mg which is introduced during reduction of PuF₄ in an MgO crucible. Concentrations of Mg vary excessively, 20 to 500 parts per million parts plutonium. Omitting Mg, a fair comparison of light element impurities and their contribution to the C/Q value results.

4. Reduction yields in the RG Line, calculated from

\[
\frac{(\text{wt. of metal}- (70-58 + 
\text{Recycle})) \times 239}{\text{wt. of PuF}_4 \text{ charged} \times \frac{315}{315}} \times 100, \text{ averaged 98.11\% for 120 runs} 
\]

reduced from processed Redox effluent as compared to 97.74\% for 200 runs reduced from material from the bismuth-phosphate process during the same period.

TABLES

Spectro-chemical analyses of S-Plant material are included in Tables I to IV to indicate the purification achieved by the major purification steps. The corresponding sample codes are:

1. P-1, - analyses of Redox effluent.

2. AT, - analysis of the product after the Isolation Building treatment of 2 peroxide precipitations.

3. DC-1,- analysis of the plutonium oxalate cake.

4. B-1, - analysis of the metal button reduced from plutonium fluoride.

Table I includes 7 batches showing items 1, 2, 3, and 4 above.

Table II includes 9 batches showing items 2, 3, and 4 above.
Table III includes 10 batches showing items 2 and 3 above.

Table IV includes 4 batches showing items 2 and 3, and 3 batches showing items 3 and 4 above.

Tables I - IV also includes pile residence in MWD, 231 Building "Sample Can" surveys in MR/hr., fluoride to metal reduction yields, and C/Q values for each batch.

Table V includes the maximum, average, and minimum impurity concentration in parts per million parts plutonium for 7 P-1, 26 AT, 48 DC-1, and 40 B-1 analyses.

Table VI includes maximum, average, and minimum impurity concentrations in parts per million parts plutonium for metal reduced from PuF$_4$ in the RM Line.
<table>
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<th>REDUCED NUMBER</th>
<th>MOLD</th>
<th>231 BATCH NUMBER</th>
<th>SURVEY</th>
<th>X UN NUMBER</th>
<th>Y RUN NUMBER</th>
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<td>S-02-02-72-26</td>
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<td>12-B-126</td>
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<td>(12-B-129)</td>
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Note: In Table II, Ride, 1988.

High As, Cd, Cu, Zn, probably Fe, Sn, Zn.

DECLASSIFIED
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**Remarks:**
- * - Interference
- ?* - Detection Uncertain
- B - Samples not taken
- L - Less Than

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L - Less Than
** - Detection Uncertain
* - Interference
G - Greater Than

Notes: Na content makes analysis for other elements difficult.
TABLE V RANGE OF IMPURITIES AFTER VARIOUS PURIFICATION STEPS

(From Spectro-Chemical Analyses Reports)

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</table>

**Symbol**
- **L**: LESS THAN
- **G**: MORE THAN

**Numerical Values = Parts per Million Parts Plutonium**

*Interference, results questionable.*

**HW-25834**
### Table VI

**RM Line Metal Impurities**

(From Spectro-Chemical Analyses Reports)

<table>
<thead>
<tr>
<th>Impurity</th>
<th>Max.</th>
<th>Ave.</th>
<th>Min.</th>
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* Does not include RMX-12-4-2 which had 2000 ppm Ni due to processing in an inconel boat.