HW-24153

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April 17, 1952

To: Raymond Ward, Head
Metallurgy
Applied Research Unit
Technical Section

From: R. W. Benoliel
Process Assistance
Separations Technology Unit
Technical Section

SERVICE OF REDUCTION BOMBS
PLUTONIUM PURIFICATION AND FABRICATION
234-5 BUILDING

We have discussed with you the construction and service of the reduction bombs in both the RG and RM Lines of the Plutonium Purification and Fabrication operation in the 234-5 Building.

[redacted]

The RG Line bomb is shown in detail in drawing No. H-2-15284 (which you saw in preparation). The vessel is constructed of a flange type carbon steel ASTM 106-45T. The RM Line bomb is shown in detail in drawings No. H-2-11510, H-2-11511, H-2-11512, H-2-20597, and H-2-21115. This vessel is built of a spec[illegible] cobalt alloy V-36 (Allegheny - Ludlum), similar to S-816 alloy (43% Co, 20% Cr, 20% Ni, 4% each Mo, W, Cb, and Fe) except that the Cb content is lower.

These bombs are charged with plutonium fluoride, calcium metal, and sulfur or iodine - then heated by an induction coil from room temperature to 500 - 750°C. in about 10 minutes. Somewhere in this higher temperature range the vigorous exothermic reaction of the calcium with the sulfur or iodine starts and the reduction of the plutonium fluoride proceeds. The induction heating of the bombs is controlled so that the temperature of the bomb as measured by the thermocouple in the well welded to the side of the bomb does not exceed the 750°C. At the time of the reaction, the gaseous pressure inside the bomb normally may quickly build up to 50 - 100 psig. (In an unusual instance the pressure built up to about 450 psig.)

After the reaction, the bomb is allowed to cool to about 100°C which takes 2 to 3 hours, when it is opened, the contents removed and preparations made to recharge the bomb.

The bombs can be expected to be used for fewer than 4 charges and firings per day.

We should like to have your opinion as to an expected life of the bombs in this service, not considering any effects of corrosion but only metallurgical factors of any spheridization, graphitization or other changes in structure of the steel and alloy, fatigue weakenings and the like. We hope you will find that the bombs can be used for 5,000 to 10,000 charges with no expectation of any failure due to metallurgical factors.

We shall appreciate a written reply for the record.

[redacted]