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February 6, 1952

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REVIEW OF ANALYTICAL REQUIREMENTS - 224-U BUILDING

Introduction

The analytical load for the UO_3 Plant (Project C-361) and the TRP Plant (Project C-362) has been reported previously in two earlier documents, HW-18016, and HW-18690, issued on 6-9-50, and 7-24-50 respectively. Flowsheet and equipment modifications subsequent to the issuance of the above mentioned documents have given rise to the need for a more recent review of the analytical load anticipated. This review which includes the projected analytical load for the periods of shutdown and normal operations of the 224-U Building has been discussed with representatives of the Separations Section and the Analytical Unit.

Since the 224-U Building is a separately-supervised unit containing all of the UO_3 Plant and part of the TRP Plant operations, the list of sample requirements for this building has been compiled separately and includes all of the UO_3 Plant requirements plus those samples of the TRP Plant that pertain to the 224-U Building operations.

The number of analyses required on the samples of UO_3 powder is subject to change depending upon subsequent discussions between K-25 and Hanford representatives. During shutdown operations individual drum samples may be analyzed to determine pot performance; however, as optimum operating conditions are established, these will be replaced by lot samples (one sample per 8 drums). As a long range

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objective it is desirable to minimize the number of determinations requested on each lot.

Summary and Conclusions

The attached Table I lists the sample code, vessel name or use, type of samples, sample volume, frequency during normal and shakedown periods, and analyses which will be required on a routine and non-routine basis. The samples and analyses listed in this table, other than those for UO_3 powder, are reasonably firm and are not expected to change as much as the analytical load for UO_3 powder.

Table II, attached, lists the number of determinations anticipated per month during normal and shakedown periods and makes a comparison between this estimate and those listed in previous documents.

This document supersedes those portions of the previous documents which apply to the 224-U Building.

Units for Reporting Analyses

Chemical assays of in-process tank and stream samples, and of sump samples are to be reported as pounds constituent requested per gallon of solution except for nitric acid which may also be reported in weight per cent. Radio chemical assays are to be reported as total counts per minute per gallon alpha and beta, and micro curies per gallon for gamma.

UO_3 powder assay results are to be reported according to the following table.

<u>Assay</u>	<u>Units</u>
Compounds	weight per cent of constituent in the sample.
Metallic ion impurities except Pu	parts per million parts of UO_3 .
Pu	parts per billion parts of uranium.
Particle size	per cent through 80 mesh screen.
Bulk density	grams per cubic centimeter.
Surface area	square meters per gram.
Beta from fission products	percent of natural uranium beta radiation.
Gamma from fission products	percent of natural uranium gamma radiation.

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TABLE I

ESTIMATED SAMPLING FREQUENCIES FOR 244-B BUILDING OPERATION

Sample Code	Vessel name or use	Sampler & Sample Volume	Frequency		Analysis		General Composition of sample
			Normal No./24 hr. day	Start-up No./24 hr. day	Routine (Required each sample)	Non-routine (As requested)	
U Lat	UO ₂ drum composite	Automatic sampler 450 gm.	- -	(a) 1.47 (1/8 drums)	UO ₂ , U ₂ O ₅ , H ₂ O, Fe, HNO ₃ , Beta (b), Gamma (b), Isotopic Ratio,	Bulk Density, Surface Area, Particle Size, Spectrographic, S.	97% UO ₂
U Lat	UO ₂ drum composite	Automatic sampler 450 gm.	(c) 5.65 (1/8 drum)	- -	(d) UO ₂ , Beta, Gamma, (b) isotopic Ratio	UO ₂ , H ₂ O, HNO ₃ , Bulk Density, Surface Area, S, Fe, Spectro- graphic, Particle Size	97% UO ₂
UTA-1P	HNO ₃ Absorb- er Plate Sampler	Bottle 50 ml.	0.25	1	Cl	HNO ₃	2% HNO ₃ , 0-0.5% Cl
UTA-1b	HNO ₃ Absorb- er Bottoms Sampler	Bottle 50 ml.	- -	1	HNO ₃	Cl	40% HNO ₃
UTB-1P	Fraction- ator Plate Sampler	Bottle 50 ml.	0.25	1	Cl	HNO ₃	2% HNO ₃ , 0-0.5% Cl
UTB-1b	Fraction- ator Bottoms Sampler	Bottle 50 ml.	1	1	HNO ₃	Cl	60% HNO ₃
UTD-1P	Fraction- ator Plate Sampler	Bottle 50 ml.	0.25	1	Cl	HNO ₃	0-0.5% Cl, 2% HNO ₃
UTD-1b	Fraction- ator Bottoms Sampler	Bottle 50 ml.	1	1	HNO ₃	Cl	60% HNO ₃
UC-1	UHM concentr- ator Receiver	Bottle 50 ml.	0.5	1	U, Density (e)	HNO ₃ , Fe, Si, Cr	60% UHM
UC-2	Radio Tank	Bayonet 5 ml.	1	1	U, HNO ₃ , Beta, Gamma		0-4% UHM
UC-3	40% HNO ₃ Tank	Bottle 50 ml.	0	1	HNO ₃	Cl, Density	40% HNO ₃
UC-4	60% HNO ₃ Tank	Bottle 50 ml.	0	1	HNO ₃ , U	Cl, Density	60% HNO ₃
UC-5	Concentrator Condensate Receiver	Bottle 50 ml.	0	1	pH, U	Beta (f) Gamma (f)	pH = 3 +
UE-1	Radio UHM Storage	Bayonet 5 ml.	0.25	0.25	U, HNO ₃ , Fe, Beta, Gamma	Fe, Cr, Si, Al	60% UHM
UE-2	70% HNO ₃ Storage	Bayonet 5 ml.	0.25	0.25	U, HNO ₃ ,	Fe, Cr, Si, Sn	70% HNO ₃
UE-19	Final UHM Concentrator Receiver	Bottle 50 ml.	0.5	1	U	HNO ₃ , Fe, Cr, Si.	60-100% UHM
UJ-1P	UO ₂ Pot Clean-out	Bottle 50 ml.			Variable probably U, HNO ₃	Spectro- graphic	Report UO ₂ & Flow readings

- Notes:
- (a) Based on 3.125 tons uranium per day plus 10% for non-routine.
 - (b) Radio activity from fission products.
 - (c) Based on 13.125 tons uranium per day.
 - (d) The number of UO₂ analysis may be 10% greater (i.e. 6.25/24 hr. day).
 - (e) Density will be required routinely as long as C-1 is used as a receiver for Radio UHM.
 - (f) May be requested routinely at start-up.
 - (g) Samples with a UHM concentration greater than 75%, will have to be diluted when taken.

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TABLE II

SUMMARY OF CONSTITUENT ANALYSES

Determination		Number Per 24 Working Day Month		
		Start-up* uranium from Redox only	Start-up** uranium from both Redox and TBP	Normal**
<u>UO₃ powder</u>				
	UO ₃	36	150	150
	U ₃ O ₈	36	-	-
	H ₂ O	36	-	-
	HNO ₃	36	-	-
	Beta	36	136	136
	Gamma	36	136	136
	Bulk density	-	-	-
	Surface area	-	-	-
	Particle size	-	-	-
	Isotopic ratio	36	136	136
	S	-	-	-
	Spectrographic	-	-	-
	Pu	36	-	-
<u>Solutions</u>				
	U	50	160	52
	Cl	24	52	21
	HNO ₃	74	100	76
	Density	24	12	12
	pH	72	72	-
	Beta	26	26	26
	Gamma	26	26	26
	Pu	2	2	2
Total	(UO ₃ powder)	288	558	558
Total	(Solutions)	226	450	213
		514	1008	773
Estimated non-routine	determinations	102	201	152
GRAND TOTAL	- - - -	616	1209	925

The normal sample load (6 to 12 month after TBP Plant start-up) was estimated to be 918 determinations per month in HW-18690 and HW-18016.

* Based on an instantaneous rate at 3 1/8 tons uranium per day.

** Based on an instantaneous rate of 13 1/3 tons uranium per day.

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