

1S sample bottle design is governed by ANSI N14.1:

- 1.5 in nominal diameter
- Capacity of 450g (1lbm) UF₆



(1) All dimensions are in inches.

(2) Modify the valve to fit the end connections shown.



- New / clean sample bottles are stored in a locked cabinet
- Entered into SAP with unique identifier, typically UREU5xxxxx
 - URE = Urenco owned
 - U = Cylinder
 - 5 = Type (1S)
 - xxxxx = Unique number
- Issued to Operations when needed
- Treated in oven to dry prior to use







- Weighed prior to filling with automatic entry in SAP
 - This is a valid tare weight
- 3 sample bottles are connected to the sampling manifold in an autoclave
- Each sample bottle is filled with approximately 200g of UF₆, then disconnected from the manifold
- Weighed after filling with automatic entry in SAP







- One sample bottle goes directly to a storage cabinet awaiting outgassed back to the process
- One sample bottle goes to a separate storage cabinet for arbitration, if required
- One sample bottle goes to liquid sub-sampling for assay measurement
- All three sample bottles are eventually out gassed back to the process



- Out gas returns UF₆ to the process
- Sample bottles containing solid UF₆ at are connected to a manifold
- Pressure is reduced causing solid UF₆ to vaporize
- UF₆ vapor solidifies in a cold trap at -60 deg C
- The UF₆ migrates from the 1S cylinders to the cold trap
- The process can be visualized on a phase diagram









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- When out gassing is complete, an isolated pressure rise (IPR) test is performed
- The IPR demonstrates UF₆ has been removed from the sample bottles
- At room temperature, the partial pressure of UF₆ is about 100 mbar
- Pressure less than 100 mbar indicates there is no more UF₆. By UUSA procedure, pressure is reduced to less that 1 mbar and outgas is considered successful with an IPR of less than 0.1 mbar.
- After a successful IPR, 1S sample bottles are weighed with automatic entry in SAP and placed in a storage cabinet for cleaning



- Cleaning is done in the SCDT
- Originally designed with safeby-design (SBD) attributes
- SBD analysis assumes SCDT components and contaminated objects completely filled with optimally moderated uranic material at 6 wt%
- IROFS are required because the SBD analysis assumes contaminated objects of a certain size, but the design does not prevent larger objects being placed in the SCDT





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- IROFS54a and IROFS54b administratively limit the uranic mass inventory to ensure a subcritical mass in the SCDT using bookkeeping procedures and by performing measurements
- The IROFS are independent
- Tare weight is taken from SAP
- Gross weight on a scale
- Net weight of UF₆ is the difference
- If net weight >20g, then return the cylinder to Operations
- Net weights are summed for all items in a SCDT campaign to ensure a subcritical mass



Scale ID:	645.58	Cal	Calibration Due Date: 10.29.2013 Daily Control Check: Good/Sal.								
Componen Name	t Component SN	Part SN	Bar Code	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Conversion Factor	Calculated 235U (g)	Running Total ²³⁵ U (g)		
10.11		No. of Concession, Name	and the owner of the local division of the l	and the second distances of th	2011	State of Lot of	Starting 235U	in SCDT	0.0320		
. Chenan	R 4AR 504091	- N/A	- N/A -	1285.2	1285.2	0	0.047	0	0.032		
	1 504210			1282.3	1282.4	0.1	0.047	.0047	.0376		
	504/87			1283.0	1283.0	0	0.047	0	.0176		
	504163			1277.8	1277.9	0.1	0.047	+0047	.0423		
	504083			1289.1	1289.1	Ó	0.047	0	.0 4 22		
	5043lda			1275.5	1275.5	0	0.047	0	.0421		
	7 504151			1277.0	1276-8	0 0	0.047	0	0471		
	504197			1282.2	1282.2	0	0.047	0	0423		
	504099			1283.2	1281.0	0	0.047	0	04123		
	504081			1285.0	1285.0	0	0.047	0	44.12		
	504334			1259.3	1259.4	0.1	0.047	.0047	.047		
	504340		1.11	1273.7	1273.7	0	0.047	0	047		
	504132			1270.2	1270.2	0	0.047	0	.047		
	504108			1283.2	1283.1	0	0.047	0			
_	504238			1259.3	1259.4	0.1	0.047	.0047	.04/		
	504338			1271.8	1271.9	0-1	0.047	0047	.0517		
V.	504140	V.	V	1275.1	1275.1	0	0.047	0	10564		

Technician Name (Print/Sign): Ite Paras / Date: 8/27/20/3



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erandin waste mass bookkeeping
RW-3-2000-05-F-4 ROFS54b for SCDT Uranium Waste Mass Determination

Scale ID:	CA5.58	. Cal	ibration Du	e Date:	10.29.20	Dail	ly Control Ch	eck: Goo	1/5-t. 9
Componen Name	t Component SN	Part SN	Bar Code	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Conversion Factor	Calculated ²³⁵ U (g)	Running Total ²³⁵ (g)
10 11		to the second second					Starting 235U	in SCDT	0.032
-S cylinde	R 4REL 504092	-N/A	- N/A -	1285.2	1285.2	0	0.047	0	0.032
	11 504210			1282.3	1282.4	0.1	0.047	.0047	10370
	504187			1283.0	1283.0	0	0.047	0	.037
	504163			1277.8	1277.9	0.1	0.047	.0047	. 1147
	504083			1289.1	1289.1	Ó	0.047	0	1042
	504366			1275.5	1275.5	0	0.047	0	.042
	7 504151			1277.0	1276.8	3 0	0.047	0	.047
	504197			1282.2	1282.2	0	0.047	0	.042
	504099			1283.2	1281.0	õ	0.047	0	. 042
	504081			1285.0	1285.0	O	0.047	0	A 4 2
	504334			1259.3	1259.4	0.1	0.047	.0047	.047
	504340			1273.7	1273.7	0	0.047	0	047
	504132			1270.2	1270.2	0	0.047	0	.047
	504108			1283.2	1283.1	0	0.047	0	047
	504238			1259.3	1259.4	D.1	0.047	.0047	.051
	504338			1271.8	1271.9	0.1	0.047	.0047	1031
V.	504140	V	V	1275.1	1275.1	0	0.047	0	1056
Ne	w Lotal *** U mass	in SCDT fr	om batch (re	cord on form	RW-3-2000-0	5-F-2, Maste	SCDT Bookk	eeping Log)	:054
			\bigcirc						

Date: 8/27/2013



								and the second	
S	Measurement document	Measuring point	Date	Meas/TotCountrRdg _	Unit	Val.	Created by	Created on	Equipment
	10061639 Measurement do	tument 580	09/03/2013	1280.200	g	GWU	CANJU	09/03/2013	UREU504108
	100571561	10231580	01/14/2013	1283.200	g	GWU	VONJA	01/14/2013	UREU504108
	100543195	10231580	08/28/2012	1440.000	g	GWR	PICJU	08/28/2012	UREU504108
	100543175	10231580		1440.000	g	GWR	PICJU	08/28/2012	UREU504108
	100543089	10231580		1440.000	g	GWR	PICJU	08/28/2012	UREU504108
	100539972	10231580	08/13/2012	1477.600	g	GWZ	SIMAL	08/13/2012	UREU504108
	100539012	10231580	08/07/2012	1283.300	g	GWU	DIGSC	08/07/2012	UREU504108
	100538988	10231580		1283.300	g	GWU	DIGSC	08/07/2012	UREU504108

- Using UREU504108 as an example;
 - Incorrect tare weight of 1283.2g chosen from SAP after out gas on Jan 14, 2013
 - Gross weight of 1283.1g measured on Aug 27, 2013
 - Net weight calculated to be zero, the expected result after out gas
 - The correct tare weight of 1283.3g taken prior to use on Aug 7, 2012
 - Result is the same using the correct tare weight
 - New tare weight of 1280.2g established after cleaning and reassembly





- 1S sample bottles are cleaned in a batch of about 20
- Configuration shown here with cylinders and valves in adjacent baths could be safe-by-design
- Baths are drained and cleaned after each batch, ALARA practice
- SCDT is drained, cleaned and dosing tanks flushed after each campaign prior to reaching the IROFS safe limit of 730g ²³⁵U
- Content is reset to 60g ²³⁵U
- The event in question was the initial campaign, with an estimated accumulation of 0.16 g ²³⁵U





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- After cleaning, sample bottles are dried and reassembled
- Sample bottles are pressure tested prior to being placed back in service
- Weighed after cleaning and testing with automatic entry in SAP
 - This is also a valid tare weight
- Cleaned sample bottles are returned to the locked cabinet completing the sample bottles life cycle

