<div style="display: flex; justify-content: space-between; align-items: center;"> <div> Sta 5 JAN 20 2000 </div> <div style="text-align: center;"> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">12</div> ENGINEERING DATA TRANSMITTAL </div> <div> Page 1 of 1 702569 </div> </div>											
2 To (Receiving Organization) Distribution		3 From (Originating Organization) PFP Process Engineering		4 Related EDT No 702568							
5 Proj /Prog /Dept /Div Pu Metal Stabilization		6 Design Authority/Design Agent/Cog Engr S Hurlbut		7 Purchase Order No N/A							
8 Originator Remarks The analysis of the need and preferred location of a TGA				9 Equip /Component No N/A							
				10 System/Bldg /Facility N/A							
				12 Major Assm Dwg No N/A							
				13 Permit/Permit Application No N/A							
11 Receiver Remarks		11A Design Baseline Document? ☐ Yes ☒ No		14 Required Response Date N/A							
15 DATA TRANSMITTED											
(A) Item No	(B) Document/Drawing No	(C) Sheet No	(D) Rev No	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition			
1	HNF-5641	1	0	Evaluation of Need/Location for a Thermogravimetric Analyzer in the Plutonium Finishing Plant Materials Stabilization Process	NA	1					
16 KEY											
Approval Designator (F) E S Q D OR N/A (See WHC-CM 3-5 Sec 12.7)		Reason for Transmittal (G) 1 Approval 4 Review 2 Release 5 Post Review 3 Information 6 Dist (Receipt Acknow Required)			Disposition (H) & (I) 1 Approved 4 Reviewed no/comment 2 Approved w/comment 5 Reviewed w/comment 3 Disapproved w/comment 6 Receipt acknowledged						
17 SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Reason	(H) Disp	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp	(J) Name	(K) Signature	(L) Date	(M) MSIN
	1	Design Authority	R. Burk	1/17/00			1	DR Speer	1/14/00	R3-56	
		Design Agent					1	R.A. BURK	1/17/00	T4-20	
1		Cog Eng	ST Hurlbut	1/17/00							
1		Cog Mgr	LL Curfman	1/17/00							
		QA									
		Safety									
		Env									
18 HT Willis Signature of EDT Originator Date 1/13/00		19 R.A. BURK Authorized Representative for Receiving Organization Date 1/17/00		20 LL Curfman Cognizant Manager Date 1/17/00		21 DOE APPROVAL (if required) Ctrl No ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments					

Evaluation of Need/Location for a Thermogravimetric Analyzer in the Plutonium Finishing Plant Materials Stabilization

HT Willis

Fluor Hanford, Inc

Richland WA 99352

U S Department of Energy Contract DE AC06 96RL13200

EDT/ECN EDT 702569

UC

Org Code 15100

Charge Code 110847

B&R Code

Total Pages 15

Key Words

Thermal Stabilization, PFP Plutonium, TGA

Abstract

This plan provides an analysis for locating a TGA to support PFP Thermal Stabilization processes

TRADEMARK DISCLAIMER Reference herein to any specific commercial product process or service by trade name trademark manufacturer or otherwise does not necessarily constitute or imply its endorsement recommendation or favoring by the United States Government or any agency thereof or its contractors or subcontractors

Printed in the United States of America To obtain copies of this document contact Document Control Services
P O Box 950 Mailstop H6 08 Richland WA 99352 Phone (509) 372 2420 Fax (509) 376 4989

<p><i>Drunkal</i> 1/20/00 Release Approval</p>	<p>JAN 20 2000 DATE STA. 5 HANFORD RELEASE ID 12</p>	<p> This Document is UNCLASSIFIED Work Performed under this requirement is ☒ UNCLASSIFIED ☐ CONFIDENTIAL ☐ SECRET ☐ RD ☐ DI <i>[Signature]</i> 01/20/00 Signature Date AUTHORIZED CLASSIFIER</p>
--	---	---

Approved For Public Release

HNF-5641

**EVALUATION OF NEED / LOCATION FOR A
THERMOGRAVIMETRIC ANALYZER IN THE
PLUTONIUM FINISHING PLANT MATERIALS
STABILIZATION PROCESS**

Revision 0

December 30, 1999

Table of Contents

EXECUTIVE SUMMARY	1
1 INTRODUCTION	3
1 1 BACKGROUND	3
2 SCOPE	3
3 PROCESS DESCRIPTION AND ASSUMPTIONS	4
3 1 PROCESS DESCRIPTION	4
3 2 ASSUMPTIONS/ REQUIREMENTS	4
4 NEED EVALUATION	6
5 LOCATION EVALUATION	8
6 REFERENCES	10

LIST OF TABLES

Table 1 Initial Screening of Gloveboxes Considered for Installation of TGA Equipment	9
Table 2 Initial Screening of Gloveboxes Considered for Installation of TGA+SFE Equipment	9

LIST OF FIGURES

Figure 1 TGA System Components	11
Figure 2 TGA Equipment and Glovebox Space Requirements	12

EXECUTIVE SUMMARY

An evaluation was performed to assess the need/location for a Thermo-Gravimetric Analyzer (TGA) furnace system in the Plutonium Finishing Plant (PFP) 234-5Z Building Analytical Laboratory or operating areas to support the PFP Materials Stabilization Process. The TGA system provides an automated method for performing Loss of Ignition (LOI) measurements in determining residual moisture content in stabilized materials. However, the LOI methodology is only accurate for use with pure plutonium oxide materials (DOE 1999, 1996). Note that a TGA system was procured previously by the PFP Facility and is not in use currently.

The TGA system need evaluation considered the advantages and disadvantages in using the TGA system together with a Supercritical Fluid Extraction (SFE) system that is already planned to be installed [note that the SFE system was evaluated in a separate study (HNF 1999)]. The SFE system is capable of performing residual moisture determination for all stabilized materials and has been recommended for approval as an alternative, residual, moisture measurement method (DOE 1999, LANL 1999). Based on a review of the U.S. Department of Energy (DOE) Standard for stabilization, packaging, and storage of plutonium-bearing materials (DOE 1999, 1996) and notes from a workshop designed to consider different methods of residual moisture detection (Wagner 1999), no externally imposed requirement was identified for including the TGA system. Only recommendations were made to include an LOI measurement system in line with the SFE system.

However, based on these recommendations and the advantages of using the TGA system with the SFE system, the TGA system is recommended for inclusion with the SFE system, ideally in colocation with the SFE system (note that the colocation of a TGA furnace system with a SFE system was evaluated separately (HNF 1999)). The advantages for the PFP Analytical Laboratory of including the TGA system with the SFE system are as follows:

1. Co-location of the TGA and SFE systems would enable the following:
 - (a) Residual moisture determination by either the TGA system or SFE system, or both,
 - (b) Performance of side-by-side residual moisture measurement method comparison (i.e., SFE versus LOI) studies, and
 - (c) Providing system redundancy needed in the event of a failure of either system or during periods of preventative maintenance of equipment in either system (note that the SFE backup capability provided by the TGA system would only apply during periods of pure oxide material processing).
2. Changes in the temperature/time profile provided by the TGA system during sample calcination would enable identification of the potential constituents of the stabilized material matrix (e.g., presence of uranium) – this capability is not available with the SFE system.

The main disadvantages for including the TGA system would be the limitation of using the equipment for only pure oxide materials, increased decontamination and decommissioning costs.

for the equipment, and the need for a new glovebox to accommodate the system size with the related cost and schedule impacts (HNF 1999) However, the cost of the new glovebox likely will be accommodated by the SFE system installation requirements

1 0 INTRODUCTION

1 1 Background

Plutonium (Pu) oxide material that is stabilized thermally at the Plutonium Finishing Plant (PFP) for long-term storage is required to meet certain criteria before storage. One criterion is the amount of moisture present in the stabilized material. The amount of residual moisture is important because excess moisture can undergo radiolysis while in storage, generating hydrogen gas that would generate higher internal pressure in the storage container, which may lead to container rupture. This potential loss of containment is precluded by reducing the residual moisture to less than 0.5 mass %.

The current U.S. Department of Energy (DOE) standard method involves material thermal stabilization by calcination at 950 °C (DOE 1996, 1999). Thermal stabilization is verified by a Loss on Ignition (LOI) test, wherein the weight loss following calcination to 1000 °C is determined. A weight loss in excess of 0.5 mass % requires that the material be re-calcined. Unfortunately, LOI does not discriminate between the various volatilized components, including inorganic salts. A significant amount of plutonium oxide destined for storage is impure, containing large amounts of inorganic salts. The supercritical fluid extraction (SFE) process has been recommended for approval as an alternative method for moisture determination that can measure sample residual moisture without the interference from the other volatile impurities since it does not solubilize inorganic materials (LANL 1999, DOE 1999).

However, a TGA system provides an automated method of performing LOI testing that could meet the moisture testing requirements for pure plutonium oxide materials.

2 0 SCOPE

The scope of this document is to evaluate the need for, and location for, installation of a TGA system as a supplement to the SFE equipment for moisture measurement in pure oxides. A location assessment for the SFE equipment was previously performed (HNF 1999). Based on that assessment, colocation of the TGA system with the SFE system is the preferred option. This would enable thermally stabilized material to be analyzed for residual moisture by either the TGA system or SFE system or both.

This evaluation considers glovebox locations in the PFP 234-5Z Building Analytical Laboratory or operating areas for the installation of the TGA system and its supporting equipment. This evaluation considers using existing gloveboxes along with an alternative of adding a new glovebox to existing process lines. The location evaluation criteria focuses mainly on glovebox size, with qualitative consideration of relative cost and schedule impacts associated with system implementation, radiological control, and interaction with other laboratory operations and processes. In addition, the possible colocation of a TGA furnace system with the SFE system was considered.

Evaluation of Need / Location for a TGA in the PFP Materials Stabilization Process	HNF-5641	Revision 0 Page 4 of 12 Date December 30, 1999
---	-----------------	---

3 0 PROCESS DESCRIPTION AND ASSUMPTIONS

3 1 Process Description

The TGA system is a well-established analytical method for determining the composition of organic, inorganic and synthetic materials, along with the concentration of volatile components. It measures weight loss as a function of temperature in real time, while the sample is heated at a known, constant rate in a controlled environment. The analyzer consists of an electronic chassis for furnace control and data management and a multiple sample furnace that allows up to 19 samples to be analyzed simultaneously. The major components of the TGA system consist of the following:

- Sample Carousel,
- Balance Pedestal,
- Multiple Sample Furnace, and
- Process Controller

The sample carousel and balance pedestal are located in the furnace. All of the major components are integrated together into the unit as shown in Figure 1, facilitating placement within a glovebox. Automatic operation controls the carousel, furnace, and balance operation. On completion of sample container weighing, the one to five gram samples are loaded and sample weight is measured and stored automatically. Each sample position is indexed automatically by position above the balance pan. The weight loss of each sample is determined automatically and the furnace temperature is controlled according to a selected analysis method.

Glovebox seal-in ports or an open front box will be required to transfer materials and samples into the glovebox. Inclusion of the TGA furnace within a glovebox would require offgas processing consistent with current PFP systems. Electrical requirements will consist of some 110-V or 208-V feedthroughs for the TGA furnace and low-power feedthroughs for control and data acquisition.

3 2 Assumptions/ Requirements

The assumptions / requirements that follow were applied in the TGA system location evaluation. These assumptions are essentially the same as those applied in the location analysis for the SFE system [see HNF-5497 (HNF 1999)]

- a One TGA setup will be required
- b Colocation of a TGA system with the SFE system will be considered and is preferred [see HNF-5497 (HNF 1999)]
- c Location of the TGA equipment in the 234-5Z Building Analytical Laboratory or operating spaces would not impact nor interrupt the routines in the laboratory [Note that the use of personnel protective equipment (PPE) several times during the day to support the TGA or SFE+TGA system is considered normal for the analytical laboratory, and would not introduce an additional burden]

- d Direct access to the samples from the glovebox via existing process conveyor lines is preferred, versus separate operation that requires material seal-in/out or transfer, and will be scored higher
- e Maintaining as-low-as-reasonably-achievable (ALARA) radiation dose rates for laboratory and operations personnel using the TGA or SFE+TGA systems will be considered in the location evaluation
- f Schedule impacts associated with TGA or SFE+TGA system implementation will be considered in the location evaluation
- g Glove access to all equipment within the glovebox is required
- h Ease of installation and relative cost and schedule impacts for TGA or SFE+TGA system implementation will be considered in the location evaluation
- i Dimensions of the glovebox must accommodate the equipment and enable personnel to operate and maintain the TGA or SFE+TGA system
- j Safeguards and Security (S&S) requirements for plutonium process operations will be satisfied similarly for any glovebox considered (existing or new) by the location in the 234-5Z Building Analytical Laboratory or operating spaces
- k Criticality safety will be satisfied similarly for any glovebox considered (existing or new) since the TGA or SFE+TGA system, will be the only process equipment in the glovebox
- l Existing gloveboxes that may accommodate the TGA or SFE+TGA system will have existing miscellaneous equipment demolished and removed – applicable cost and schedule impacts will be noted for these gloveboxes [see HNF-5497 (HNF 1999)]
- m Seismic analysis will be satisfied similarly for any glovebox considered (existing or new) to accommodate the TGA or SFE+TGA system – applicable cost and schedule impacts will be noted for those gloveboxes requiring new seismic analysis
- n Fire suppression requirements will be satisfied similarly for any glovebox considered (existing or new) to accommodate the TGA or SFE+TGA system – applicable cost and schedule impacts will be noted for those gloveboxes requiring installation (or removal) of fire suppression systems
- o Process interactions will be considered in the location evaluation (e g , nearby high-radiation areas, congestion of processes, streamline of process flow, etc)
- p Available, uncontaminated gloveboxes considered for addition to existing process lines or operating areas will meet certification requirements – applicable cost and schedule impacts will be noted for such certification, along with applicable modifications to meet requirements for use in material stabilization processing (e g , glove specifications, seal quality, window quality, etc)
- q Design and procurement activities associated with fabrication of a new glovebox versus using an available, new uncontaminated glovebox from other facilities at the Hanford Site would be prohibitive in terms of cost and schedule impacts [see HNF-5497 (HNF 1999)]
- r Location evaluation will consider the gloveboxes existing on the Remote Mechanical C (RMC) line in rooms 228A,B,C, and separate gloveboxes located in rooms 136 and 157 (note that Glovebox HA-23S in room 235C will not be

- considered because of its future potential use as a material feed lag storage and staging area, the glovebox in room 154 was not considered because of its higher priority use identified for that glovebox, the glovebox HC-9B will not be considered because of the extra floors splitting glovebox)
- s Location of a new glovebox will consider room 235C only (note that movement through double doors with 7-ft-high x 6-ft-wide dimensions will allow glovebox transfer into room 235C), room 230C will not be considered because of congestion with other process operations
 - t The TGA or SFE+TGA system will be located away from other processes or areas with high contact dose rates to reduce personnel dose (ALARA), note that the RMA line gloveboxes will not be considered in the location evaluation because of existing high-radiation levels in this area
 - u Installation and testing of the TGA or SFE+TGA system within an available uncontaminated glovebox is preferred and will be scored higher
 - v The TGA or SFE+TGA system design will allow disassembly for transfer into the glovebox, using available 24-in seal-in ports
 - w The cost of connecting lines from the CO₂ cylinder, computer linking, electrical sources, and offgas (to existing process vacuum) to the equipment to be located inside the glovebox will be similar for all the identified gloveboxes
 - x Clearance requirements around the TGA system equipment will consist of the dimensions as shown in Figure 2 for the TGA equipment The resulting dimensional envelope for the TGA system is approximately 47-in -wide x 45-in -deep x 30-in -high, and 110-in -wide x 45-in -deep x 30-in -high for the combined SFE+TGA system [see HNF-5497 (HNF 1999)] The approximately 10 5-in clearance above the TGA furnace allows for opening the lid, while the 12-in clearance in front of the furnace was considered adequate for staging the samples to be analyzed
 - y New uncontaminated gloveboxes that exist on the FMEF pellet sintering line would be available for use at the PFP for less than approximately half the cost of fabrication of a new custom glovebox
 - z Environmental requirements will be satisfied similarly for any glovebox considered (existing or new) to accommodate the TGA or SFE+TGA system, by system installation within the 234-5Z Building Analytical Laboratory in existing glovebox operating areas to enable using current environmental control equipment and processes (e g , control of air emissions via existing glovebox exhaust systems, contamination control via current plutonium material process and handling requirements, etc)

4 0 NEED EVALUATION

The need evaluation considered the advantages and disadvantages in using the TGA system for LOI testing, together with a SFE system that is already planned to be installed [note that the SFE system was evaluated separately (HNF 1999)] The draft DOE Standard 55XX-99 [DOE 1999, note that this will replace the current standard, DOE-STD-3013-96, (DOE 1996)] for

stabilization, packaging, and storage of plutonium-bearing materials states that research has shown that oxide materials other than pure plutonium dioxide (i.e., Pu content greater than approximately 80 to 85 wt%) are unlikely to pass the LOI test, even though their moisture content may be acceptably low. It's estimated that pure Pu oxides represent approximately 20% of the total materials to be stabilized. Thus, the standard encourages use of LOI to verify stability of fairly pure Pu oxide materials and use of moisture-specific methods (e.g., SFE) for lower grade materials. It should be noted that the SFE system only has been approved as an alternative to the LOI method (LANL 1999).

The SFE equipment will have the capacity to process all samples required by thermal stabilization to support production throughput. The SFE equipment is capable of completing the quantitative analysis of a sample in approximately one half-hour. This would provide a maximum capability of 48 samples per day, which is far in excess of the current five-furnace production rate of 10 batches per day.

The TGA system has the capability to analyze up to 19 samples simultaneously, completing quantitative analysis of these samples in approximately two hours. Thus, it also could provide the capability to exceed the anticipated furnace production rate. However, the TGA system is applicable only to pure Pu oxide materials. Note that a TGA system was procured previously by the PFP Facility and is not in use currently.

Conceivably then, the TGA system could provide the bulk of the moisture testing for the pure Pu oxide materials and retain the SFE system for the impure oxide material, prolonging its operational lifetime.

The possible co-location of a TGA furnace system with a SFE system was evaluated in a separate study (HNF 1999). Co-location of the TGA and SFE systems would enable the following:

- a. Residual moisture determination by either the TGA system or SFE system or both,
- b. Performance of side by side residual moisture measurement method comparison (i.e., SFE versus LOI) studies, and
- c. Providing system redundancy needed in the event of a failure of either system or during periods of preventative maintenance of equipment in either system (note that the SFE backup capability provided by the TGA system would apply only during periods of pure oxide material processing).

An alternative SFE backup capability would be to maintain a second SFE system in a non-contaminated area that could replace a failed contaminated SFE system. Indeed, discussions with the SFE developer indicate that the Savannah River Site is pursuing this alternative backup strategy.

Notes from the Moisture Methods Workshop held at Los Alamos National Laboratory (Wagner 1999) recommended that SFE be put in line with LOI test equipment (e.g., a TGA system) so that it is easy to run both methods concurrently, especially when gathering baseline correlation.

Evaluation of Need / Location for a TGA in the PFP Materials Stabilization Process	HNF-5641	Revision 0 Page 8 of 12 Date December 30, 1999
---	-----------------	---

data on pure oxides. It was also noted that the first material planned for processing at PFP will be fairly pure with mixed oxides to follow.

Discussions with analytical laboratory personnel indicated that the TGA system would also provide information related to the potential constituents of the material matrix. For example, the presence of uranium would be indicated by observing changes in the temperature/time profile provided by the TGA system during calcination. This effect is caused by uranium oxidation during calcination that would cause a characteristic temperature/time profile to occur. This material characterization capability would be important concerning material data records before vault storage. The SFE system would not have this capability.

Discussion with a TGA system manufacturer representative indicated that servicing and maintenance of the system in a glovebox should not present a problem.

The main disadvantages for including the TGA system would be the limitation of using the equipment for only pure oxide materials, increased decontamination and decommissioning costs for the equipment, and the need for a new glovebox to accommodate the system size with the related cost and schedule impacts (HNF 1999). However, the cost of the new glovebox will likely be accommodated by the SFE system installation requirements.

Summary

Based on the DOE Standard for stabilization, packaging, and storage of plutonium-bearing materials (DOE 1999, 1996) and notes from the workshop designed to consider different methods of residual moisture detection (Wagner 1999), no externally imposed requirement was identified for including the TGA system. Indeed, only recommendations were made to include an LOI measurement system in line with the SFE system. However, coupling these recommendations with the advantages discussed for the PFP Analytical Laboratory of including the TGA system with the SFE system, the TGA system is recommended for inclusion with the SFE system, ideally in colocation with the SFE system.

5.0 LOCATION EVALUATION

The TGA system location evaluation was performed to assess potential glovebox locations in the PFP 234-5Z Building Analytical Laboratory or operating areas. This evaluation considered using existing gloveboxes along with an alternative of adding a new glovebox to existing process lines.

An initial screening of gloveboxes was made based on glovebox sizes needed to accommodate the TGA equipment with clearances as shown in Figure 2, and based on other concerns identified in Section 3.2, Assumptions r, s, and t. The results of the initial screening are shown in Table 1. Only new gloveboxes available from other site sources will meet the size requirements of the TGA system. Table 2 shows that only one new glovebox meets the size requirements of the combined SFE+TGA system.

Table 1 Initial Screening of Gloveboxes Considered for Installation of TGA Equipment

Glovebox	Dimensions (in)			Location in 234 5Z	Remarks
	Width (W)	Depth (D)	Height (H)		
Required Size	47	45	30		
GB 136	120	38	31	Rm 136	Undersized for TGA
GB 154	86	33	30	Rm 154	Undersized for TGA
GB-157	36	30	32	Rm 157	Undersized for TGA
HC 7C	96	36	10	Rm 228A	Undersized for TGA
HC-9B	88	36	125	Rm 228A	Undersized for TGA
HC-10	26	17	25	Rm 228A	Undersized for TGA
HC-11	86	28	27	Rm 228A	Undersized for TGA
HC 12S	31	26	41	Rm 228B	Undersized for TGA
HC-13MD	38	35	58	Rm 228B	Undersized for TGA
HC-15	100	29	72	Rm 228B	Undersized for TGA
HC 16CC	26	24	47	Rm 228B	Undersized for TGA
HC 17DC	46	26	53	Rm 228C	Undersized for TGA
HC 17P	34	26	53	Rm 228C	Undersized for TGA
HC 17SBB	67	21	34	Rm 228C	Undersized for TGA
HA 23S	144	47	68	Rm 235C	Meets TGA dimensions Not considered due to other planned uses (see Sec 3 2,r)
New (FA 30341)	110	50	48	Rm 230C	Meets TGA dimensions, Not considered due to congestion with other processes in room (see Sec 3 2,s)
New (FA-30341)	110	50	48	Rm 235C	Meets TGA dimensions
New (FA-30350)	138	34	56	Rm 235C	Undersized for TGA
New (FA-30344)	104	52	66	Rm 235C	Meets TGA dimensions
New (FA 30340)	99	38	42	Rm 235C	Undersized for TGA

Table 2 Initial Screening of Gloveboxes Considered for Installation of TGA+SFE Equipment

Glovebox	Dimensions (in)			Location in 234-5Z	Remarks
	Width (W)	Depth (D)	Height (H)		
Required Size	110	45	30		
New (FA 30341)	110	50	48	Rm 235C	Meets SFE+TGA dimensions
New (FA 30344)	104	52	66	Rm 235C	Undersized for SFE+TGA

A new glovebox, available from the Fuels and Materials Examination Facility (FMEF) fuel pellet sintering line, would accommodate the TGA or SFE+TGA system dimensional requirements. This new glovebox could be located in Room 235C and mated to conveyor HA-28 to provide the optimum solution. Advantages of using a new glovebox include colocation of the SFE+TGA equipment and its uncontaminated state which facilitates equipment installation and testing outside of process areas. After testing is complete, the new glovebox can be mated in modular fashion to the existing HA-28 line conveyor systems in room 235C to receive material samples.

Evaluation of Need / Location for a TGA in the PFP Materials Stabilization Process	HNF-5641	Revision 0 Page 10 of 12 Date December 30, 1999
--	----------	---

directly, consistent with maintaining a streamlined material process flow. The relative costs and schedule impacts of certifying this new glovebox and installing at PFP were evaluated in a previous engineering study (HNF 1999) and found to be significantly less compared to preparing an existing glovebox to receive the TGA or SFE+TGA equipment. Future detailed cost and schedule analyses can verify this aspect.

Summary

The dimensional requirements for the TGA system require locating the system in a new glovebox. Because it is anticipated that the SFE system installation will also require a new glovebox (HNF 1999), it is recommended that the TGA system be colocated with the SFE system in this same glovebox. The new glovebox would be located in Room 235C and mated to conveyor HA-28.

6 0 REFERENCES

- DOE, 1996, *Criteria for Preparing and Packaging Plutonium Metals and Oxides for Long Term Storage*, DOE-STD-3013-96, 1996, U S Department of Energy, Washington, D C
- DOE, 1999, *Stabilization, Packaging, And Storage Of Plutonium-Bearing Materials*, Draft DOE-STD-55XX-99, September 1999, U S Department of Energy, Washington, D C
- HNF, 1999, *Location Assessment for the Supercritical Fluid Extraction Instrumentation*, HNF-5497, Revision 0, December 21, 1999, B&W Hanford Company, Richland, Washington
- LANL, 1999, *A Comparative Study Of Methods For The Determination Of Residual Water In Impure Plutonium Oxides And Recommendation Of Method For Site Implementation*, LA-UR-99-3019, June 1999, Los Alamos National Laboratory, Los Alamos, New Mexico
- LECO, 1995, *Instruction Manual - TGA-601 Thermogravimetric Analyzer*, Version 1.3, June 1995, LECO Corporation, St Joseph, Michigan
- Wagner, 1999, *Notes From Moisture Methods Deployment Workshop – Los Alamos National Laboratory August 24-25 1999*, August 1999, Los Alamos National Laboratory, Los Alamos, New Mexico

Figure 1 TGA System Components

Figure 2 TGA Equipment and Glovebox Space Requirements

[illegible]