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		Date November 10, 1994
Project Title/Work Order Functions and Requirements for K Basin SNF Characterization Shipping		EDT No. 606316
		ECN No.

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1	1	Cog. Mgr./R. P. Omberg	<i>[Signature]</i>	11-18-94	B3-85	C. A. Thompson	<i>[Signature]</i>	11-18-94	B3-72	1	1
1	1	QA/J. I. Diehl	<i>[Signature]</i>	11-18-94	X3-71	J. E. Truax	<i>[Signature]</i>	11-18-94	X3-71	1	1
1	1	Safety/J. J. Vistica	<i>[Signature]</i>	11-18-94	X3-22						
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1		K. D. Dobbin	<i>[Signature]</i>	11-18-94	N2-32						

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**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz

January 4, 1995

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7. Abstract This document details the plan for the shipping of fuel samples from the K Basins to the 300 area for Characterization.		

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8. RELEASE STAMP
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Functions and Requirements for K Basin SNF Characterization Shipping

Table of Contents

- 1.0 Introduction
- 2.0 Purpose
- 3.0 Summary of Significant Activities
- 4.0 Plan Description
- 5.0 Additional Information

Functions and Requirements for K Basin SNF Characterization Shipping

1.0 INTRODUCTION

The fuel characterization project will evaluate the Hanford defense production fuel (N-Reactor and Single Pass Reactor) to support interim storage, transportation and final disposition. A limited number of fuel samples will be transported to a laboratory for analysis. It is currently estimated that 20 shipments of fuel per year for approximately 3 years (could be as long as 5 years) will be transported to the laboratory for analysis. Based on the NRC certificate of compliance each shipment is limited to 500 equivalent grams of ^{235}U ¹. In practical terms this will limit shipments to three outer elements² or two assemblies of any type of N-Reactor or SPR fuel. Case by case determination of broken fuel will be made based on the type of fuel and maximum potential fissile content.

ChemNuclear's CNS 1-13G cask has been chosen to transport the fuel from the 100 K Area to the 300 Area. This cask was chosen because it has a Certificate of Compliance (CoC) issued by the U.S. Nuclear Regulatory Commission (NRC) authorizing it to be used in the transport of irradiated oxide and metallic fuel. The configuration of the irradiated N Reactor/SPR fuel deviates from the CoC in that the fuel cladding may be breached. To compensate for the possibility of failed cladding, inner containers will be designed and constructed to maintain the irradiated fuel covered with water during shipping. This, plus the highly controlled transportation environment provided at Hanford, will provide a degree of safety commensurate with that of the cask used as per the CoC.

It should also be noted that fuel samples will be periodically returned from the laboratory to the K-Basins. It is estimated that fuel sample returns could increase cask loading/unloading operations by an additional 20 operations per year. It is not anticipated that any fuel samples will be returned during the first year.

2.0 PURPOSE

The purpose of this document is to provide a description of the activities required to transport fuel from the K Basins to the 327 laboratory for examination and analysis and to return fuel samples to the K Basin and disposition returned fuel after examination.

¹ ^{235}U equivalent mass is determined by ^{235}U mass plus 1.66 times the ^{233}U mass plus 1.66 times the Pu mass.

² N-Reactor fuel consists of tube inside a tube. The combination of the tubes is considered to be a "fuel assembly". The tubes by themselves are referred to as elements (either an inner or outer tube).

3.0 SUMMARY OF SIGNIFICANT ACTIVITIES

Operating and maintenance procedures will be utilized, (where required by WHC/DOE policy) to perform all tasks necessary for fuel shipments. Additionally, all personnel required to perform these procedures will be trained. The following are the shipping related activities that will take place in conjunction with fuel sampling in support of the SNF Characterization program

3.1 Canister transport to the south loadout pit transfer channel

Canisters chosen for examination will be moved from their main storage basin rack locations to the south loadout pit transfer channel using existing canister hoists and canister handling tools. Selection of canisters for sampling will be accomplished by utilization of the data quality objectives (DQO) process.

3.2 Fuel sampling

Canisters contain a maximum of 14 fuel assemblies. KW canisters are sealed with a lid and, once in the south loadout pit transfer channel, will be decapped using current canister handling tools. Except for differences in canister design, the tooling and procedures for handling canisters are similar for both basins.

New tooling will be fabricated to allow vertical removal of fuel from the storage canisters. All tooling will be tested prior to being used in the K Basins.

Fuel chosen for examination will be removed from the fuel storage canister and placed in single fuel element container³ (SFECs) in preparation for shipment to the 327 facility.

3.3 Single fuel element container hydrogen generation pressure test

After placement of a fuel sample (assembly, element or chips) in an SFEC, hydrogen generation testing will be performed to ensure that any hydrogen generation is within transportation limits (maximum of 2.5 vol % H₂). To accomplish this, a specially designed SFEC lid will be utilized to measure SFEC pressure increase. Once the pressure test is complete, a new, vented lid will be installed on the SFEC.

3.4 Load single fuel element containers into shipping cask and prepare for Shipment

A ChemNuclear CNS 1-13G cask will be used for shipment of fuel samples. Prior to placing the cask into the basin water, a strippable paint will be applied to minimize decontamination efforts. The cask will then be

³ A SFEC can contain a fuel element or assembly

lowered into the loadout pit and loaded with SFECs; up to three single fuel element containers may be loaded and shipped at one time. When the cask is removed from the loadout pit, the cask will be sprayed with water and strippable paint removed to reduce surface contamination.

3.5 Ship cask to 327 facility

After the cask has been decontaminated, the cask will be placed on a flat-bed trailer and protective overpack installed on the cask. Hazardous Materials Operations will ensure that the cask is ready for over the road shipments and that transport route is restricted. The cask will then be transported to the 327 facility over existing Hanford roads that will be controlled to preclude public use during transportation.

The flat-bed trailer will be supplied by ChemNuclear and the truck tractor will be supplied by Westinghouse Hanford.

3.6 Return fuel specimens from 327 facility to K Basins

After characterization analysis activities on the fuel element specimens are complete, the fuel elements and fuel pieces will be shipped back to the appropriate K Basin.

3.7 Disposition of returned fuel

Fuel elements and fuel pieces taken from KW Basin with a ^{235}U content greater than .95% must be returned back to the KW Basin. Fuel from the KW Basin with a ^{235}U content less than .95% will be returned to either the KE or KW basin. All fuel returned to the KW Basin will be re-encapsulated in Mk II canisters and the canisters returned to the main basin storage racks.

Fuel elements and fuel pieces taken from KE Basin will be returned back to the KE Basin. The fuel elements pieces returned to KE Basin will be placed in open canisters and returned to the main basin storage racks.

4.0 PLAN DESCRIPTION

The SNF Characterization Functions and Requirements includes activities in the K Basin and transport of fuel to and from the 327 examination facilities. Details of these activities are described below.

4.1 Canister Transport to the South Unloading Pit

Fuel storage canisters are kept in the main basin storage racks. All KW fuel sampling activities will be conducted in the south loadout pit. KE fuel sampling activities will be conducted in the south loadout pit or in the KE Tech View pit if the dump table is available. The only activity that will be conducted in the main basins will be moving canisters between the main basin racks and the pits. Canister movement will be done using existing basin equipment and procedures.

4.2 Fuel Sampling

Fuel sampling consists of removing selected fuel elements from storage canisters and placing them in single fuel element container (SFECs). The SFECs are fabricated per Westinghouse Hanford Company drawing H-1-80394.

Procedures to remove fuel elements from KE and KW canisters will differ due to differences in canister designs. The differences are highlighted below.

The KE fuel is stored in open canisters. In some cases there are loose identification plates on top of the containers that need to be removed to gain access to the fuel elements. In most cases the tops of the canisters are completely open.

The KW fuel is encapsulated in sealed canisters with water containing potassium nitrite corrosion inhibitor and a nitrogen gas space. The KW containers will be decapped to allow sampling.

When the canister has been cleared of covers or decapped, one or more selected fuel elements will be pulled out of the canisters and placed in SFECs using new sampling tools.

The fuel canisters will be re-encapsulated when fuel sampling is completed. The canisters will then be returned to the main basin storage racks.

4.3 Single fuel element container hydrogen generation pressure tests.

One limitation on use of the ChemNuclear cask is that hydrogen accumulation levels inside the cask can not exceed 2.5 % of its free air volume. In order to assure that this limit is not exceeded, an in-basin test of the SFECs will be performed. The test will use a special SFEC lid that is vented to a small instrumented tank to measure pressure. Any pressure increase will be directly proportional to the hydrogen generation rate. An allowable shipping window based on pressure increase rate and known relationships between SFEC, pressure measuring tank and shipping cask gas volumes was developed for the hydrogen test (See Attachment 1).

Once the pressure test is completed, a new, vented lid will be installed on the SFEC. The SFECs will remain filled with water during shipment.

4.4 Load SFECs into shipping cask and prepare for shipping

The SFECs will be shipped using a ChemNuclear CNS 1-13G cask. The cask package consists of a stainless steel encased, lead shielded cask and a double-walled, carbon steel shipping protective overpack. The cask cavity is 54 inches high by 26-1/2 inches in diameter. The cask package is capable of transporting Fissile Class III material and protecting the enclosed radioactive material from normal conditions of transport and hypothetical accidents. The cask and its safety analysis are described in the Safety Analysis Report (CHEM-NUCLEAR). Based on the NRC certificate of compliance each shipment is limited to 500 grams of ²³⁵U. In practical terms this will limit shipments to three outer elements or two assemblies of any type of N-Reactor or SPR fuel. For SPR fuel the control limit is one fuel assembly per SFEC. Case by case determination of broken fuel will be made based on the type of fuel and maximum potential fissile content.

Cask loading will be performed in the following sequence.

1. The cask is lowered into the loadout pit.
2. The cask lid is removed and set aside.
3. The SFECs are set into a rack inside the cask cavity. The rack is designed so that it fits within the cask inner cavity and minimizes movement of SFECs during transportation.
4. The cask lid will be reinstalled on the cask.

After the cask has been closed, it will be lifted out of the loadout pit. The cask cavity will be drained, flushed if necessary and sealed. A silicone rubber gasket (which is inspected prior to entering the loadout pit) and six 1-inch bolts provide positive, non-vented closure of the cask. A special strippable external paint, applied before the cask was lowered into the pit to minimize contamination, will be removed. The cask will be decontaminated to levels required by WHC-CM-1-6, *WHC Radiological Control Manual*.

4.5 Ship cask to 327 facility

After the cask has been decontaminated, it will be placed on a special flat-bed trailer provided by Chem-Nuclear. In order to secure the cask, it will be placed onto a cask base which is joined to the trailer. The protective overpack will then be bolted to the cask.

Transport of the cask on the special flat-bed trailer will use a truck tractor supplied by Westinghouse Hanford Company. Hazardous Material Operations will ensure that the cask is ready for shipment by reviewing all transport documentation, verifying driver certifications, verifying that the cask is adequately secured, and coordinate road closures. The transfer route will be over Hanford roads which will be controlled to preclude public access during the transfer. During transport, the maximum speed of the transport vehicle will be limited to 35 miles per hour. Transport will be prohibited during icy road conditions, when visibility is seriously impaired by fog, rain, snow or dust and when the ambient temperature is less than 32 °F.

4.6 Return fuel specimens from 327 facility to K Basins

After fuel characterization activities are completed at the 327 facility, the fuel specimens and any fragments created during examination will be returned to the appropriate K Basin using the same transportation precautions as practiced when transporting fuel from the K Basins to the 327 facility.

4.7 Disposition of returned fuel

The cask returning fuel taken from the KW Basin will be coated with strippable paint and placed in the KW or KE basins south loadout pit. Fuel returned to the KW basins encapsulated in Mark II canisters, and returned to main basin storage racks.

The cask returning fuel taken from the KE Basin will be coated with strippable paint and placed in the KE south loadout pit. Fuel removed from the cask will be placed back into open canisters and returned to main basin storage racks.

At both basins, the cask may be left in the pit to be loaded with new fuel samples or taken out and decontaminated.

5.0 ADDITIONAL INFORMATION

5.1 Environmental Controls

5.1.1 Air Permit Requirements

An air permit has been obtained for this activity from the Washington Department of Health. Meeting minutes issued on February 15, 1994 provided the approval to perform this activity (see Attachment 2). This approval was amended on 3-23-94 to clarify requirements. The following summarizes the air permit requirements.

- 1) Strippable paint, or equivalent, shall be applied to the cask prior to placing it in the basin water to minimize decontamination efforts.
- 2) Continuous air monitoring equipment will be operated during sampling and cask loading operations as defined in the encapsulation notice of construction.
- 3) As the shipping container is removed from the basin water it will be washed down to minimize the spread of smearable contamination and potential airborne releases.
- 4) The shipment is to occur in a commercial shipping cask using a design currently approved by the NRC.
- 5) The ion exchange columns and/or ion exchange modules (IXM's) will be operated continuously during sampling/cask loading operations.
- 6) If the water quality requirements identified in the encapsulation notice of construction are exceeded in the KE Basin, sampling operations are to be suspended until water quality improves to acceptable levels.

The air permit for KE Basin SNF characterization activities is based on the encapsulation notice of construction (WHC/RL-93-13), while the air permit for the KW Basin is based on memorandum documenting a meeting with the Washington State Department of Health. Excerpts from these meeting minutes are in Attachment 2 to this plan. The exception to the encapsulation notice of construction is that no green houses are required for this activity.

5.1.2 Monitoring during Transport

A review of the shipping process was performed by Near Field Monitoring. They determined that radioactive monitoring programs in the 100 and 300 areas are sufficient for this activity with the following exceptions.

- 1) If loaded trucks are staged outdoors then additional monitoring at these locations will only be required if the integrity of the cask is compromised. Notification of Near Field Monitoring is required if a loaded cask is staged for more than 30 days.
- 2) Radiation monitoring of the routes used to transport the loaded casks, including the staging areas, will be conducted immediately following the shipments, only if the integrity of the cask is compromised during transport.

5.2 Transportation Limitations

The transport container has several limitations that must be met. These limitations are documented in the Safety Evaluation for packaging (WHC-SD-TP-SEP-028) and the packaging design criteria (WHC-SD-TP-PDC-022). The following summarizes these requirements.

- 1) Hydrogen levels must not exceed 2.5 vol. %. Hydrogen levels will be measured in the K Basins prior to shipment to ensure that this limit is not exceeded.
- 2) Based on the NRC certificate of compliance each shipment is limited to 500 equivalent grams of ^{235}U . In practical terms this will limit shipments to three outer elements or two assemblies of any type of N-Reactor or SPR fuel. Case by case determination of broken fuel will be made based on the type of fuel and maximum potential fissile content.
- 3) All fuel samples will be transported in vented single fuel element container.
- 4) The transport cask must be decontaminated to levels sufficient to allow over the road transport of the cask.
- 5) The transport will be performed over closed roadways.
- 6) Transport vehicle speeds will be limited to 35 mph.
- 7) Transportation will be prohibited during icy road conditions, when visibility is seriously impaired by fog, rain, snow, or dust and when the ambient temperature is less than 32°F.

5.3 Hydrogen Testing

To ensure that the generation of hydrogen during the transport of the fuel samples is within the shipping limit of 2.5 vol. % (as indicated above) an in basin test will be performed. A special lid has been manufactured for the single fuel element container that will allow the monitoring of pressure increases. This lid is vented to a small tank, instead of the storage pool, to allow the measurement of gas generation. The pressure increase will be directly proportional to the hydrogen generation rate. Attachment 1 determines the time available to ship the fuel from pressure increase information determined during the test.

This first fuel shipment must have a shipping window, as defined in the pressure test using Attachment 1, of at least one week. Subsequent shipments may allow shorter shipping windows depending on the efficiency of transport operations.

6.0 REFERENCES

Weber, J.W. "Review of Consequences of Uranium Hydride Formation in N-Reactor Fuel Elements Stored in the K-Basin", WHC-SD-SNF-SAR-001, Rev 0, September 28, 1994

Chem-Nuclear Systems, Inc, "Safety Analysis Report for CNS Model 1-13G Shipping", Container, Rev 0, December 1987

DOE/RL-93-13, "Notice of Construction for the 105 KE Encapsulation Activity", March 1993

ALLOWABLE CLOSURE
TIME (DAYS).

WHC-SD-SNF-FRD-007

The following contains excerpts from the routine interface meetings with the Washington Department of Health (DOH) and the Department of Energy (DOE). The originals are signed by A.W. Conklin of the DOH and S.D. Stites of DOE.

Proposed Fuel Shipments (Initial Heads Up):

- 1) 105 KE to 300 Area (For Fuel Characterization)
- 2) 105 KW to 300 Area (For Fuel Characterization)

Ms. Coenenberg introduced Mr. Dave Bergmann (WHC, K Basins) for a description of the planned irradiated fuel sampling at the 105 KE and 105 KW Basins, as well as shipment to the 327 Building for sampling and characterization. A cask of NRC-approved design will be used for shipments. All fuel handling and encapsulation for shipment will occur underwater. Mr. Steve Jette (PNL, Facilities Management) explained that analysis of the fuel for characterization will occur at the 327 Building and will represent routine operations there. The radioactive air emissions sampling system associated with the 327 Building main stack has been recently upgraded to comply with the requirements of 40 CFR 61, Subpart H. The fuel characterization work will be vented to the 327 Building main stack.

Mr. Conklin approved loadout of the fuel from the KE Basin and shipment to the 327 Building, as well as characterization work to be conducted at the 327 Building. His approval was based upon his determination that the planned activities were in line with those activities recently approved at the basin with regard to the planned encapsulation of all stored fuel. Mr. Conklin stated that emissions from the fuel handling associated with the shipment preparations would be held to the compliance with the operating conditions already specified as a condition of the earlier NOC approval.

Mr. Bergmann went on to describe the particular details associated with the planned fuel handling and encapsulation for shipment at the KW Basin. The first shipment has been scheduled for April, 1994. The rest of the shipments would begin in July, 1994, then occur as needed over the next 12 to 18 months. Mr. Conklin approved the proposed activities at the KW Basin. He stated that the activities will represent a modification at the facility, and that based upon the description provided, he found that the risk of significant air emissions was small enough such that approval could be granted immediately, with the following conditions: 1) Continuous air monitoring equipment will be operated during the work 2) the ion exchange columns will be operated continuously 3) as the shipping canister containing fuel is removed from the basin, it is to be decontaminated and 4) the shipment is to occur in a commercial shipping cask of current NRC-approved design.

Mr. Conklin further required that if any problems were identified regarding the air pathway during any part of the work just approved for the KE or KW Basin, he was to be notified immediately.

213-W Compactor Facility: Update

Ms. Barbara Broomfield (WHC, Solid Waste Division) provided a summary of plans to utilize the 213-W Compactor Facility for inspection and some repackaging of low level waste packages. The compactor itself has been disabled. A greenhouse will be installed over the front portal of the compactor with use of the existing emission control system and registered stack. The compactor room has been used in the past for emptying of low level waste drums, with repackaging for compaction. The planned use will represent continued operations regarding the handling of the waste and packages. Approximately 2,000 cfm flow will be maintained out the stack.

(ATTACHMENT 6) (Pg 17)

From: John A Bates at -WHC155 2/16/94 9:41AM (1672 bytes: 32 ln)
David W (Dave) Bergmann at -WHC281
Cc: John A Bates
Subject: Your Comments on 2/2/94 Routine Meeting Minutes

----- Message Contents -----

Dave,

Your comments arrived in the mail after Al Conklin had already signed the minutes. What I suggest is that at the 3/2/94 meeting the comment items could be covered with Al to document he has no problems. If updating Al this way would cause problems, please let me know.

Sorry we missed getting them included this time. I did add the names you suggested to the distribution of the 2/2/94 minutes.

For later reference, I have your comments as:

Proposed Fuel Shipments (Initial Heads Up):

1st Paragraph, add the following to the second sentence.
"..utilizing a strippable coat of paint to facilitate decontamination efforts."

2nd Paragraph, add mention that the limits of the current NOC for KE Basin work will be followed with the exception that a greenhouse will not be available. This is due to the size of the shipping container.

3rd Paragraph, listed item 2), change the phrase "ion exchange columns" to read "ion exchange columns and/or ion exchange modules (IXMs)."

Thanks.

John