

APR 14 1997
Sta 37 22

ENGINEERING DATA TRANSMITTAL

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Spent Nuclear Fuel Evaluations	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Spent Nuclear Fuel Project	6. Design Authority/ Design Agent/Cog. Engr.: A. L. Pitner	7. Purchase Order No.: N/A
8. Originator Remarks: Approval and Release.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: N/A
11. Receiver Remarks: 11A. Design Baseline Document? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date:

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	HNF-SD-SNF-TP-034		0	TEST PLAN FOR SURFACE AND SUBSURFACE EXAMINATIONS OF K EAST AND K WEST FUEL ELEMENTS	N/A	2	1	

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged	

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
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TEST PLAN FOR SURFACE AND SUBSURFACE EXAMINATIONS OF K EAST AND K WEST FUEL ELEMENTS

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U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 620789 UC: 2070
Org Code: 2T650 Charge Code: LB026
B&R Code: EW7070000 Total Pages: 5

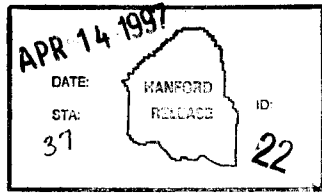
Key Words: K Basin Fuel, Subsurface Sludge

Abstract: The test plan for subsurface examinations on damaged K East and K West Basin fuel elements is presented. The purpose of these examinations is to inspect damaged areas on the fuel elements for the presence of voids, sludge, or broken fuel, and to obtain samples from the damaged areas for subsequent characterization tests.

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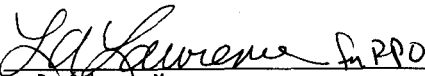
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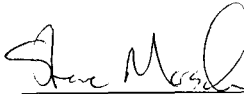
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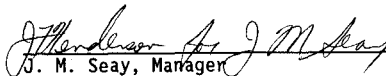



Approved for Public Release

Document Title: Test Plan for Surface and Subsurface Examinations of K East and K West Fuel Elements

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1.0 INTRODUCTION

Over 2,000 metric tons of Spent Nuclear Fuel (SNF) are presently stored in the K East and K West Basins at the Hanford Site. This fuel is primarily irradiated N Reactor fuel, with a small inventory of Single Pass Reactor (SPR) fuel. Much of the fuel is known to be in a state of degradation, and continues to deteriorate with time. Also, the storage basins which are located close to the Columbia River are known to have leaked on occasion in previous years. An Integrated Process Strategy (IPS) has been developed (WHC 1995) to move the fuel to an interim dry storage facility over the next several years.

Fuel characterization data are required to support IPS implementation. Data Quality Objectives (DQOs) have been developed to ensure that planned examinations fully support the IPS to resolve the safety and environmental concerns associated with the deteriorating fuel in the K Basins (Lawrence 1996a and Lawrence 1997a). A Letter of Instruction (Lawrence 1996c) has been issued that authorizes Babcock & Wilcox Hanford Company to conduct examinations of K Basin fuel elements in the 327 Building Postirradiation Testing Laboratory. One of the activities identified in these examinations concerns inspection for subsurface sludge in damaged areas of the fuel elements, and obtaining samples of the material for characterization testing. Specific fuel elements from both K East and K West Basins have been identified for these endeavors (Lawrence 1996b and 1997b).

The purpose of the subsurface examinations of K Basin fuel elements is to inspect damaged areas of the elements for the presence of voids, sludge, or broken fuel, and to obtain samples from the damaged areas for subsequent characterization tests. These tests include chemical analysis of the material to identify its composition, and drying tests to provide needed data for the IPS. Other testing on the recovered material may be performed as necessary to provide required IPS characterization data, such as ignition testing.

The basic examination procedure entails first measuring the depth of voids or corroded fuel in damaged areas of the as-received fuel elements using a calibrated probe. The cladding will then be peeled away from the damaged areas to expose the underlying surfaces for additional examination and to provide access for obtaining samples of the subsurface material. Samples will be obtained using appropriate pick and scraping tools and brushes.

2.0 ELEMENTS SELECTED

Specific fuel elements have been selected from the K East and K West sampling campaigns for these examinations (Lawrence 1996b and 1997b). The identification system used includes the identification of the Single Fuel Element Canister (SFEC) in which the fuel elements are contained, and the canister barrel from which the fuel elements were extracted. One element is from the K East Basin (SFEC 9-94-09/5427E). Two of the elements are from the K West Basin (SFEC 9-94-15/6743U and SFEC 12-96-6/7913U).

3.0 EXAMINATION PLAN

In a meeting of stakeholders (DESH, PNNL, & BWHC) held on March 19, 1997, it was agreed that the following specific processes will be performed in the course of these examinations:

- Possible scraping of surface coatings to obtain samples to supplement those taken from other K Basin fuel elements.
- Depth measurements in damaged areas on the as-received fuel elements using a calibrated probe.
- Prying open and peeling back the cladding in damaged areas to further expose the underlying surface.
- Obtain samples of broken fuel and sludge material recovered from the subsurface of the damaged areas for subsequent characterization testing. This operation will likely entail the use of pick and scraping tools and brushes to secure the prescribed samples.

All steps of the examination and sample recovery processes will be recorded on videotape. This includes a high resolution camcorder for shooting through the hot cell window, and a radiation-hardened camcorder for close up viewing inside the hot cell. Audio narration on the videotape will record observations as appropriate, and a detailed logbook will be maintained to document activities and observations.

In obtaining subsurface samples for characterization testing, material from multiple cracks or damage areas on the same element may be combined unless there are visual differences, in which case the samples shall be separate. Caution must be exercised to minimize material loss and to avoid cross contamination of samples as appropriate, as well as contamination from the cell environment. New or clean tools shall be used for each fuel element examined, and for different samplings on the same elements if visual differences dictate separate sampling. Samples shall be placed in uniquely identified containers and weighed.

Detailed Test Instructions will be issued to direct the examination procedure and ensure that the examination and sampling objectives cited here will be achieved.

4.0 EXPECTED RESULTS

It is anticipated that these examinations will provide some definition of the nature of subsurface voiding and fuel corrosion on damaged fuel elements stored in the K Basins. It is also expected that adequate samples will be obtained for prescribed characterization testing of subsurface sludge and broken fuel. This testing will provide needed data to support the IPS.

A written report presenting the results of the examinations and descriptions of the characterization samples obtained will be issued upon completion of the task.

5.0 QUALITY ASSURANCE

Pending (1) a determination of the need for quality assurance (QA) requirements fully consistent with DOE/RW-0333P and (2) the resolution of the SNF project providing funding consistent with this activity, the QA requirements to be used with this activity should follow the requirements documented in (Lawrence 1996c). The Hanford Spent Nuclear Fuel Project is currently reviewing the QA requirements for all SNF project activities and the QA requirements for this work activity may change in the future.

Quality assurance procedures are specified in (Henderson 1997).

6.0 REFERENCES

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