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105K EAST & 105K WEST FUEL TRANSFER BAY CRANE USE
STRATEGY FOR SNF PATH FORWARD

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105 K East and 105 K West Fuel Transfer Bay Crane Use Strategy for Spent Nuclear Fuel Path Forward

K. E. Ard

Westinghouse Hanford Company, Richland, WA 99352
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Abstract: The purpose of this document is to outline the K Basins 30 ton crane qualification strategy for use in the Spent Nuclear Fuel Project fuel relocation campaign.

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**105 K EAST AND 105 K WEST FUEL TRANSFER BAY
CRANE USE STRATEGY FOR
SPENT NUCLEAR FUEL PATH FORWARD**

WHC-SD-SNF-SP-009, REV. 0
April 1, 1996

**105 K EAST AND 105 K WEST FUEL TRANSFER BAY CRANE USE
STRATEGY FOR SPENT NUCLEAR FUEL PATH FORWARD**

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105 K EAST AND 105 K WEST FUEL TRANSFER BAY CRANE USE STRATEGY FOR SPENT NUCLEAR FUEL PATH FORWARD

1.0 PURPOSE

The purpose of this document is to outline the K Basins 30 ton crane use strategy for the Spent Nuclear Fuel (SNF) Path Forward Project.

2.0 SUMMARY

The mission of the Spent Nuclear Fuel Path Forward Project is to safely move approximately 2100 metric tons of unprocessed spent nuclear fuel from 105 K East (KE) and 105 K West (KW) fuel storage basins to the 200 East Area. The 105 KE and 105 KW fuel transfer bay 30 ton rated cranes will be used to support the transfer of approximately 100 Multi Canister Overpacks (MCO), per basin, per year for two years. The lifted loads will be at the rated capacity of the cranes. The cranes shall be operated in such a manner as to assure that consequences of failure related to crane equipment or crane operations remain within the safety envelope prescribed in the K Basins facility Safety Analysis Report (SAR) (Meichle 1996). Safety analyses supporting the crane usage and failure consequences shall be evaluated by the K Basins Standards and Requirements Group and documented as required in the K Basins SAR.

The strategy hinges on the K Basins Standards and Requirements Group's ability to get RL approval on an increased basin leakage limit in the SAR. If the change is made, a non-seismically qualified trolley and hoist may be used because damage to the Safety Class 1 boundary during a seismic event will not contribute to the exceedance of the SAR allowable basin leak rate. If the change to the allowable basin leak rate is not approved or timely, one of three options will be implemented. A procurement strategy has been developed that will allow the SNF schedule to be met regardless of the SAR change approval status. Also, an attempt to rerate the cranes to a higher capacity is incorporated into this strategy.

3.0 BACKGROUND

The 105 KE and 105 KW fuel storage basins including the pit areas are classified as Safety Class 1 (Langevin 1995). The thirty ton cranes are operated over the 105 KE and 105 KW fuel storage basin loadout pits. It is necessary to demonstrate that the cranes, and the loads handled by the cranes, will not damage the Safety Class 1 boundary in such a manner as to allow a basin water leakage rate to exceed the SAR allowable. The Safety Class 1 boundary integrity can be challenged by a seismic event causing the crane trolley and/or load to fall.

The SAR (Meichle 1996) was based on a basin leakage rate of 1500 gallons per hour which is assumed to occur at the construction joint in the discharge-pickup chute. During a seismic event, the failure of the crane hoist which results in a load drop could damage the Safety Class 1 boundary at the loadout pit. Leakage from this breach plus the leakage from the construction joint could cause the leakage rate to exceed the SAR allowable.

Analysis (Winkel 1995) confirms that the fully loaded thirty ton bridge, trolley and transfer bay building structural members will not fail during a seismic event. Two concerns have been eliminated with this analysis:

- A thirty ton cask drop due to failure of the bridge or support structure.
- A crane trolley drop from the bridge.

The crane hoist, however, has not been analyzed to ensure that the suspended load does not drop during a seismic event.

4.0 STRATEGY

The 105 K East and 105 K West fuel transfer bay crane use strategy for SNF Path Forward is depicted in Figure 1. Success of any one of four parallel activities will ensure compliance with the SAR:

- Attempt to increase the allowable leak rate in the SAR.

- Attempt to qualify the existing hoist to the intent of ASME NOG-1 seismic criteria.
- Design and install a cask drop energy absorption device.
- Procure a seismically qualified crane hoist.

A change to the allowable SAR leak rate is the primary path. The other three paths will be followed in the case when the SAR change is not achievable. Two other actions are incorporated into the SAR compliance activities. They are:

- Provide improved load position and speed control.
- Provide a crane with a greater capacity, if possible.

If the SAR allowable basin leakage limit is not increased, the procurement strategy provides a trolley and hoist that meets the intent of ASME NOG-1, seismically. If the leakage limit is increased, a Crane Manufacturers Association of America (CMAA) #70 standard industry type trolley and hoist will be provided.

SAR Change

The K Basins Standards and Requirements Group will attempt to revise the K Basins SAR to include a greater basin leak rate due to a cask drop during a seismic event such that the combined leakage from the seismic barriers and cask drop are within the authorization basis. If this effort is successful, no changes will be required to qualify the crane for use with respect to SAR. However, the cost and schedule for added controls and possibly increased capacity rating modifications will be compared to the costs and schedule of purchasing of a new CMAA #70 hoist and trolley. In the event that the effort to change the maximum basin leak rate in the SAR is unsuccessful, one of three solutions will be implemented.

1. Utilize the Existing Trolley and Hoist

An attempt will be made to qualify the existing equipment. The crane bridge and trolley analysis (Winkel 1996), verifies that the bridge and trolley will not fall during the seismic event. Further analysis is required to assure that the hoist will not drop its load during a seismic event. The trolley and hoist (UNC 1983) shall be analyzed to

ASME-NOG-1, Section 5111 and 5310 for purposes of determining equivalency. The hoist analysis will proceed if the methodology is proven to be commonly practiced and accepted in the nuclear industry. If the methodology is acceptable, then the strategy is to seismically qualify the hoist and perhaps increase the capacity of the trolley and hoist. Design input from additional crane structural analysis will determine what capacity is attempted. The cost and schedule of upgrading the equipment for seismic qualification and for increased capacity while adding additional control equipment will be evaluated. If the analysis methodology is not acceptable, this effort will be dropped.

2. Design and Install a Cask Drop Energy Absorption Device

In parallel with the effort to qualify the existing equipment, an energy absorption device will be designed to eliminate damage to the basin floor by a cask drop. The only change to the crane would be to upgrade the controls and if practical, rerate the capacity. For this effort, costs include design, construction, and installation of the device along with the cost and schedule of upgrading the controls and modifications to rerate the crane, if possible.

3. Install a Seismically Rated Crane Hoist

The third solution is the purchase and installation of a ASME NOG-1 Type I hoist and trolley. This type of hoist and trolley is by definition, single failure proof and seismically qualified to remain in place and support the critical load during and after a seismic event. As the cost and schedule of this purchase is considerable, the procurement strategy assures that if this option is required, the equipment is installed prior to the SNF scheduled completion date of the basin modifications.

Procurement Strategy

The results of the effort to change the basin leak rate in the K Basin SAR will not be known in the near future so a procurement strategy has been developed that assures the SNF schedule is met. A Request For Proposal (RFP)

will be published which requires bidders submit five-part proposals which include estimates for the following:

1. A NOG-1 Type I trolley and hoist.
2. A CMAA #70 trolley and hoist rated at the capacity determined by the capacity limit of the bridge crane and structure.
3. Equipment and possible installation for upgrading the controls and rerating the existing trolley and hoist capacity.
4. Equipment and possible installation for upgrading the existing trolley and hoist with the controls only.
5. No purchase

5.0 CONCLUSION

The strategy addressed in this document provides a methodology for demonstrating that the K Basin fuel movement can be done safely with the 105 KE and 105 KW transfer bay bridge cranes. Qualification to the herein specified criteria will verify SAR compliance.

6.0 REFERENCES

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UNC, 1983, *30-Ton Capacity Double Drum Top Riding Double Girder Trolley/Hoist*, Purchase Order R4L-HHH-73816, UNC Nuclear Industries, Richland, Washington.

FIGURE 1

FLOW CHART FOR 105 K EAST AND 105 K WEST FUEL TRANSFER BAY CRANE USE STRATEGY FOR SPENT NUCLEAR FUEL PATH FORWARD

DISTRIBUTION SHEET

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