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Implementation of Criticality Controls in the KIS Facility at SRS

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INTRODUCTION

- A major mission of the K-Area Complex (KAC) of the Savannah River Site (SRS) is the long-term storage of plutonium oxide using stainless steel containers which meet DOE STD 3013-2004.

- The K Interim Surveillance (KIS) facility is used at SRS to perform Destructive Examination (DE) and Non-Destructive Examination (NDE) surveillances of selected 3013 containers, as required in DOE STD 3013-2004.

INTRODUCTION (Cont)

- A Criticality Safety Evaluation was performed for operations in the KIS Facility and this evaluation defined controls that are consistent with the requirements for a facility with no Criticality Alarm Accident System.

- The SRS Criticality Safety Manual requires that the implementation of such controls reduce the probability of a criticality accident to a level judged incredible.

INTRODUCTION (Cont)

- This paper summarizes the development of the criticality controls for the KIS facility and reviews implementation of the controls.

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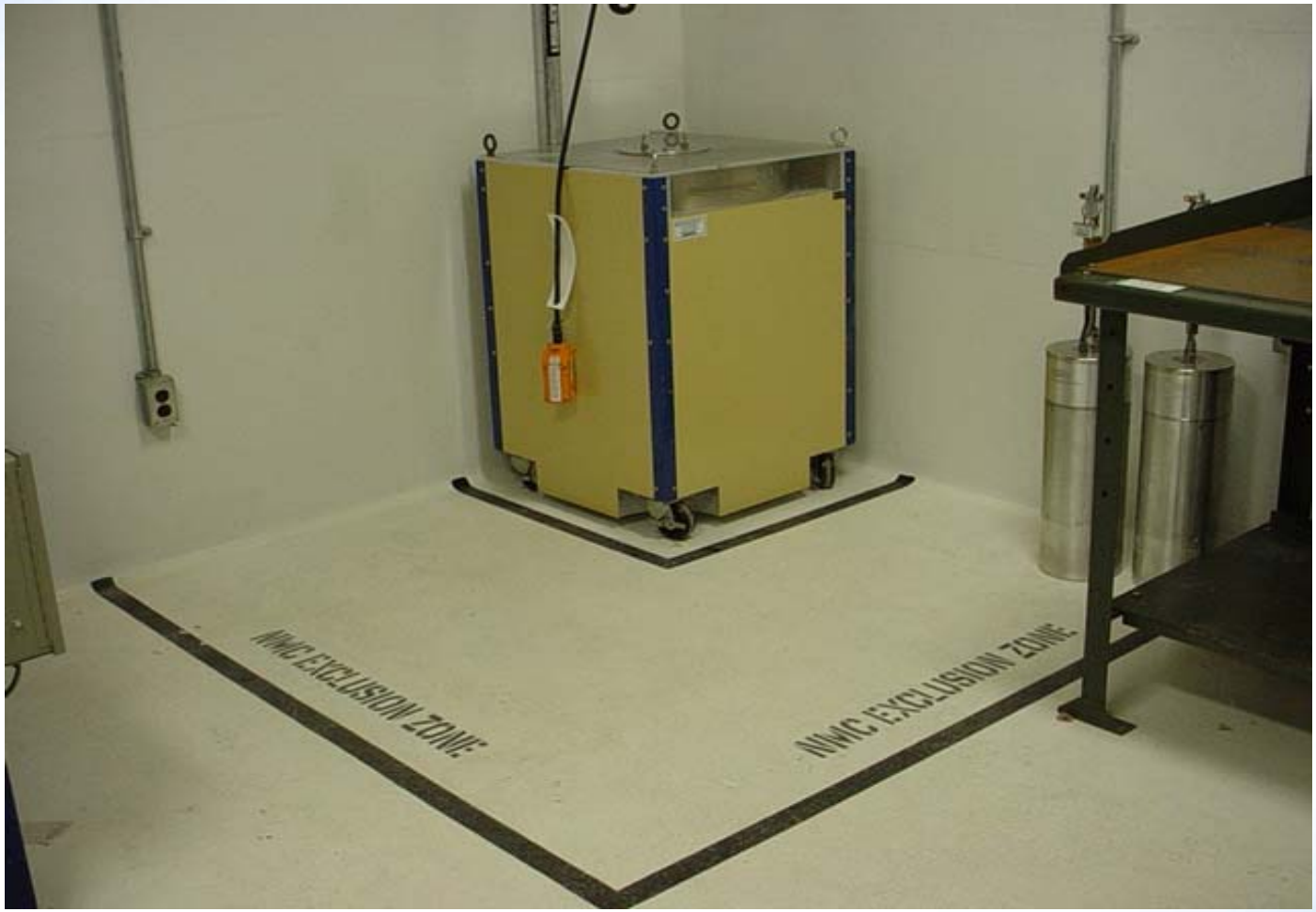

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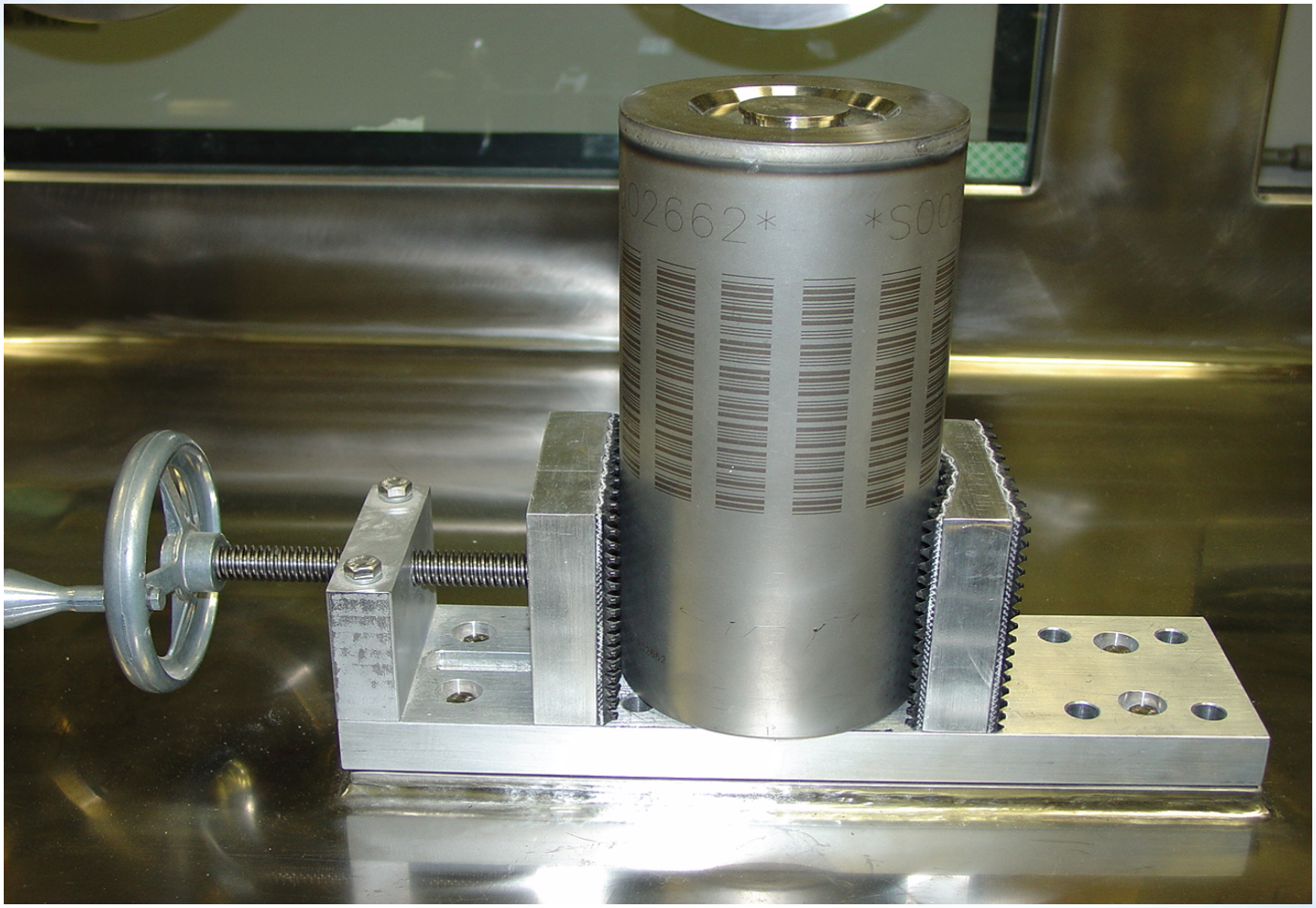

DESCRIPTION OF THE ACTUAL WORK

- The NCSE review of the proposed process activities for the KIS operations identified possible conditions postulated to result in a critical configuration.

- The NCSE discussed thirteen major accident scenarios (along with the appropriate variations) in detail and either showed the postulated configuration to be a subcritical condition.

DESCRIPTION OF THE ACTUAL WORK (Cont)

- The implementation of certain limits/ requirements, or controls (identified in the Process Initiated criticality frequency analysis calculation) was required to make the postulated critical configurations Beyond Extremely Unlikely.

- The limits/requirements/controls developed for KIS operations were presented in Section 7 of the NCSE, as shown in the following table.

DESCRIPTION OF THE ACTUAL WORK (Cont)

Control Type	Control Description	Number of Items
Bounding Assumptions	Fissile Material Description	7
Bounding Assumptions	Frequency Calculation Conclusions	13
Bounding Assumptions	Material Handling Assumptions	9
Design Features	Design Features	24
Administrative Controls	Programatic Elements	13
Administrative Controls	Individual Elements	61
Administrative Controls	Defense in Depth Items	5

DESCRIPTION OF THE ACTUAL WORK (Cont)

- Of the 61 individual Elements, 44 items are from the Process Initiated criticality frequency analysis calculation and seven are from the Fire Initiated criticality frequency analysis calculation.

- The controls were written in a manner to facilitate review (e.g., the evaluation Section and/or frequency calculation assumption giving the basis for the control is identified) and implementation (all of the controls are numbered).

DESCRIPTION OF THE ACTUAL WORK (Cont)

- A matrix was developed to review the controls and document the implementation of each item. The form of the matrix entries were tailored to match the implementation method used for the control.

- In cases where multiple changes in a short time are not expected (e.g. Design Features), the matrix directly documented the reference(s) that show that a specific requirement is satisfied (e.g., the report that determines the maximum volume of a piece of equipment and compares this volume to a requirement in the evaluation).

DESCRIPTION OF THE ACTUAL WORK (Cont)

- In cases where multiple changes in a short time are expected (e.g., where procedures were used to implement Administrative Controls), the matrix referred to the Linking Document Database (LDD) for the facility. The intention was to provide traceability while using existing resources.

- The KIS process involves the use of about 40 procedures and at the procedure level, steps used to implement evaluation requirement(s) are identified as being “Nuclear Safety Control (NSC)” items.

DESCRIPTION OF THE ACTUAL WORK (Cont)

- Since the LDD is designed to list procedures and does not list the individual procedure step(s) which are used to implement a requirement, the NSC step contains a “trailer” which identifies the requirement that is being implemented.

- This is similar to the system that is used at SRS to identify and track the implementation of Technical Safety Requirement (TSR) Surveillances.

NCSE Control Example

7.2 Design Features

The KIS design shall be controlled such that the following characteristics are maintained. The NCSE section(s) associated with each Design Feature are noted at the end of the appropriate statement.

1.a. The KIS Vault and Room 910-A shall meet PC-3 criteria for seismic, high wind, and tornado events. The gaseous fire suppression system and HEPA filtered ventilation system shall be qualified to the PC-2 level. The PC-2 seismic hazard exceedance frequency is 1E-3 /y with an associated Peak Ground Acceleration value of 0.1 g. (Section 5.1, I/A 3.1- 1)

b. The KAC building is located above flood level and the KIS Vault and Room 910-A are located above grade.
(Section 5.1, I/A 3.1- 4)

c. The KAC structure is sufficient to protect shipping packages in KIS and Room 910A from vehicular impact.
(Section 5.1, I/A 3.1- 8)

Implementation Matrix Example

NCSE Section	Requirement/Control Description	Implementing Procedures/ Documents
7.3.2.11.45	Prior to staging a waste drum in Room 910-A, the handling operator contacts the CCR for the updated inventory. The updated inventory provided by the CCR is compared against the pre-transfer calculation of inventory and validated to be consistent. Verification of the comparison is performed	See LDD

LDD Example

ID	NUMBER	Rev	Requirements	Implementing Procedures	Comments
688	N-NCS-K-00024, 7.3.2.11.45	6	Prior to staging a waste drum in Room 910-A, the handling operator contacts the CCR for the updated inventory. The updated inventory provided by the CCR is compared against the pre-transfer calculation of inventory and validated to be consistent. Verification of the comparison is performed	SOP-CSS-100-K SOP-CSS-103-K SOP-CSS-106-K SOP-CSS-108-K	

Procedure Example

Step 9.4.2 of SOP-CSS-103-K:

- REQUEST CCR Operator to independently calculate the new Room 910-A inventory, AND

  RECORD the value below: [NSC N-NCS-K-00024, 7.3.2.11.45]
  New Room 910-A Inventory (Pu-239 FGE)
  Init._____ SPV_____

RESULTS

- The latest version of the criticality controls for the KIS facility were completely implemented at the beginning of December of 2008. Future control changes will be managed through the procedure revision system, the LDD and Surveillance Test Database management systems and/or the Configuration Control system, as appropriate.

RESULTS (Cont)

- The SRS Criticality Safety Manual only requires that the controls must be identified, and the use of an implementation matrix and NSC steps satisfies this requirement. The LDD and procedure "trailers" are being used to facilitate future control upgrades and help ensure that the required controls are not inadvertently modified or deleted. A similar identification and labeling system may be useful to operations at other sites.

RESULTS (Cont)

- Representatives from Operations, Design Authority Engineering, Regulatory Programs and Criticality Safety Engineering were consulted throughout the development of this evaluation.