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40430-PL-0010	1PCN10	APPROVED	SILO 3 RETREIVAL AND DISPOSITION NUCLEAR HEATH AND SAFETY PLAN	ATT: RAYER, DIANA L Project: 40430

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EFFECTIVE DATE	PCN NO.	REV. NO.	DESCRIPTION
03-23-05	2	1	Changes to: (1) Section 1.4.3, *Silo 3 Material Retrieval and Packaging Activities*, to describe the in-line automatic samplers installed above Packaging Stations A and B; (2) Section 10.4, *Derivation of Safety Basis Requirements*, to make text consistent with PR-3; (3) Appendix B, under *Executive Summary*, and Sections B-3.2.3 and B-3.3, to change facility designation from Radiological to Less Than Nuclear; (4) Section, B-4.0, *Final Hazard Category*, to clarify purpose of Appendix G, and to change facility designation from Radiological to Less Than Nuclear; (5) Appendix F (FHA), on Pages 8, 16, 18, and 21, to remove the word "DELETION" left over from a previous PCN; (6) Appendix G, *Accident Analysis*, under Section G-2.3, *Common Assumptions*, to explain the calculated bulk density of 73 lb/ft^3 used in EBA-4; (7) Section G-3.4, *EBA-4: Breach of Full Package*, to discuss the calculated bulk density of 73 lb/ft^3; (8) Table G.3-4, *Breach of a Full Package Scenario Results*, to provide new dose values; (9) Section G-3.7, *EBA-7: ISO Penetrated*, to clarify ISO staging; (10) Table G.4-1, *Dose for Comparison to Emergency Guideline*, to provide new dose values for EBA-4; (11) Table G.4-2, *Dose for Comparison to Emergency Guideline Using Conservative Assumptions*, to provide new dose values for EBA-4; (12) App. G, Att. 4, *EBA-4 Spreadsheet, EBA-4 Solids Release*, to provide new dose values based on calculated bulk density of 73 lb/ft^3.
04-15-05	3	1	Changes to: (1) Section 1.4.3, *Silo 3 Material Retrieval and Packaging Activities*, under *Preliminary Pneumatic Retrieval and Equipment Installation*, to make past tense and to delete references to vacuum wand boots; and under *Routine Pneumatic Retrieval*, to delete discussions of vacuum wand boots; (2) Table 10-1, *Silo 3 System Safety Requirements*, to delete PR-4 regarding the flexible boots on the vacuum wands per DCN 40430-JEG-277 and DCN 40430-JEG-278; (3) Section 10.4, *Derivation of Safety Basis Requirements and Process Requirements*, to explain deletion of PR-4.

EFFECTIVE DATE	PCN NO.	REV. NO.	DESCRIPTION
05-24-05	4	1	Change to: (1) Section 16.0, *Emergency Response Plan*, to reflect replacement of landline phones with cell phones, elimination of the Communications Center, and clarification of Silos Project rally points; (2) Appendix F, *Fire Hazards Analysis*, to reflect replacement of land line phones with cell phones, and the replacement of the Savannah Communications Center monitoring system with local Protected Premises alarms.
07-07-05	5	1	Change to: (1) Section 10.3, *Silos Project Technical Safety Requirement (TSR)*, to specify new maximum values for area live loads and concentrated live loads; (2) Section 16.0 *Emergency Response Plan*, to change location of Rally Point 10; (3) Section 20, *References*, to update reference information for the OU4 TSR document.
08-31-05	6	1	Change to: (1) Section 1.4.3, Silo 3 *Material Retrieval and Packaging Activities*, to clarify that remote retrieval may require personnel entry into the Silo.
09/22/05	7	1	Change to (1) Section 7.0 *Hazards Assessment* to add Task 17, "Personnel Entry into Silo for excavator maintenance, ramp installation, material retrieval, etc", (2) Section 9.0 *Hazards Control Matrix* Table 9-1, to revise Task 15 "Cutting a Hole in the Silo 3 Wall Structure" to reflect current documentation (3) Section 9.0 *Hazards Control Matrix* Table 9-1, to add hazards from new Task 17. (4) Appendix A Section A-1.1, *Scope*, to clarify that Appendix A does not address wall cutting and personnel entry, these hazards are addressed in the OWI and in Section 9.
12/07/05	8	1	Change to (1) Sections 1.4, 1.4.1, 1.4.3, to add manual direct loading to descriptions, (2) Section 7.0 *Hazards Assessment* to add Task 18, "Direct Manual Loading Tasks (material retrieval and movement, bag placement, sampling, surveying)", (3) Section 9.0 *Hazards Control Matrix* Table 9-1, to add hazards from new Task 18, (4) Section 10.2, Table 10-1, *Silo 3 System Safety Requirements*, added PR-9 requiring HVAC and PVS for direct loading, (5) Appendix A, Table A.3-4 *Matrix of Tasks*, and Table A.4-1 *Final Hazard Assessment* to address Task 18, (6) Appendix D, added Section D-5.4 and Table 5-2 to address Direct Manual Loading, (7) Appendix F, (8) Appendix G, Section G-2.0 *Accident Analysis Methods* to discuss direct manual loading potential accidents, (9) Appendix H, Sections H-2.0 *General Description* and H-5.1 *Engineering Controls*, to add manual direct loading and delete obsolete portions.
12/21/05	9	1	Change to (1) Section 1.4.3, to clarify manual direct loading
2/03/06	10	1	Change to (1) Section 1.4.3, to address new IP-2 containers, (2) Table 10.1 PR-2 to reflect new IP-2 containers, (3) Section 10.4, *Derivation of Safety Basis Requirements and Process Requirements*, to reflect new IP-2 containers

PCN1

Container Filling and Sampling

For both PRS- and MRS-retrieved waste, the final package is a tested and approved DOT (Department of Transportation) IP-2-compliant (Industrial Package Type 2) soft-sided, sturdy-but-flexible, polypropylene bulk bag containing a sealed poly-vinyl choride (PVC) liner. The bulk bag measures 72" x 48" x 48". The containers were certified IP-2 via testing per 49 CFR Part 173 [Ref. 26] and Part 178 [Ref. 27].

PCN10

The test container was filled with 7,000 pounds of surrogate material similar in characteristics to Silo 3 material. Two tests were performed using: (1) a surrogate similar to conditioned material; and (2) a surrogate similar to untreated material. Tests performed included a Free Drop Test, a Stacking Test, and a Vibration Test. Both test articles completed the test series, demonstrating no loss of material during or after testing. Late in the project, alternate bags were procured that were tested at less than 7,000 pounds, and the operating procedures were revised accordingly.

Each of the two Package Loading Stands is a computer-controlled (PLC), semi-automated system with loading spouts, loading stands, thumper tables, weighing scales, sealers, and motorized roller conveyors for transporting the filled bags away from the station. There is a camera in the area to allow remote viewing of bagging operations.

PCN1

Material will be dropped through the fill chutes into the PVC liner. Once material flow into the container has been started, an aqueous conditioning solution will be sprayed on the material as it passes through the chute. After the container is full, a small slit will be made in upper region of the container spout. A tube sampler will be manually inserted into the spout to collect a predetermined material volume which will be extracted and placed in a sample jar (the sample will be analyzed at a Silos Project lab outside the Silo 3 facility). The sample slit will then be taped closed (per procedure) so that a slight vacuum can be pulled on the liner to facilitate an RF-sealing and liner perforation process. This proceduralized process makes an upper seal, a perforation, and two lower seals to ensure that none of the powdered waste is released to the adjacent work area (from either the liner or the residual liner spout once the container is disconnected from the chute).

PCN2

In-line dry material samplers have been installed underneath the screw feeders for the two drop chutes above Packaging Station A and B. Each sampler includes a PLC controller for setting sampler timers and counters. The sampler will collect numerous grab samples in a 125-ml plastic sample jar. When material flow is verified, the operator will initiate the sampling cycle. The sampler will then perform a number of grab samples, as programmed, with a set time delay between samples. When the sampler has completed the sampling routine, the operator will unscrew the sample jar, place a lid on it, and attach a new jar for the next sampling event. The sample will be handled and analyzed in a manner similar to samples taken from the Silo 3 waste packages.

PCN1

After liner sealing, the lower part of the liner neck will be detached from the chute by tearing at the perforation. The container assembly, (container and loading frame) will move away from the fill chute to be closed, surveyed, and labeled. The trimmed-off and sealed upper part of the liner neck will be retained by the fill chute and blown into the next liner bag to be filled. In the event of failure of the RF seal, the liner may be closed using the alternate method approved during container tests [Ref. 65], or an Engineering-approved alternative.

The PRS baghouse collector has high-level switches to provide alarm at High level and shutdown at High-high level. An interlock associated with the packaging stand weight transmitters will stop the upstream conveyor, which in turn stops other upstream equipment. The operator will also be able to observe bag loading via a miniature camera inside the packaging filling head and associated monitor. The operator will also be able to feel the container as it is filled. The operator can stop the equipment when, by visual and/or touch, the bag is full.

Bag-filling is totally contained. If a bag is overfilled, there will be no release of material. Excess material can be addressed by vibrating the package to lower the level of material. There is a capability (a port) to vacuum excess material if needed. Vacuum activity would make use of containment (plastic bagging), a work plan, and a Radiation Work Permit (RWP).

PCN1

Filled Container Management and Preliminary Staging

After a soft-sided container is filled and the PVC liner is sealed, the container assembly is moved to the Package Staging Conveyor where swipe sampling and surveys of the container assembly are performed. If no contamination is found, the container is then transported through an airlock to the Cargo Container Bay, where it is closed and placed on a shipping pallet. The containers are surveyed to meet shipping requirements and staged for labeling inside the Cargo Bay. Equipment and material, including containers of Silo 3 material, will be released from the Silo 3 facility when the exterior of the item meets DOT surface contamination limits. Therefore, it is planned that shipping activities will take place in a Controlled Area.

A labeled soft-sided container will be loaded by forklift into an International Standards Organization (ISO) container on the Interim Staging Area [ISA] (i.e., Silo 3 Pad). Due to anticipated radioactivity variability between soft-sided containers, these bags will undergo preliminary staging on the ISA. This entails placing four bags in an ISO (an ISO can hold up to eight bags). This allows bags to be retrieved from different staged ISOs to create a shipping ISO with eight bags that, as a unit, will meet shipping requirements. Once loaded, ISOs will be handled in one of the following manners: (1) one ISO each will be loaded onto a truck trailer on the ISA using a heavy forklift, and staged for shipment off-site; or (2) the loaded ISO will be moved by heavy forklift to a staging area for shipment off-site. Video cameras allow for remote viewing of the process and personnel.

PCN1

If an IP-2 container is rejected because it does not pass the QC check, it can be repaired per an Engineering and Rad-approved process, or the shipping/packaging supervisor can have the package placed in the Excavator Service Room where its contents can later be recycled to a Packaging Station via the Excavator Bin.

Manual Direct Loading

If material consistency in the bottom layers of Silo 3 is found to contain high moisture or is too compacted for processing through the existing retrieval systems, an alternative approach consisting of bulk retrieval and direct loadout may be employed. This work would be performed with a manned, enclosed cab, diesel powered front-end loader, retrieving material from inside the silo and loading it into containers in the excavator room.

PCN8

10.2 Silo 3 System Safety Requirements

The matrix in **TABLE 10-1** has been developed to identify Silo 3 System Safety Requirements, reference the origin of the requirements, and identify the method(s) of control and implementing document(s), as appropriate. These System Safety Requirements are provided for Defense-in-Depth. Table 10-1 is the requirements matrix pursuant to the DOE-approved *Decision Basis Document Implementation of 10 CFR 830 Safe Harbor Requirements for the Silos Projects,* 40000-RP-0034 [Ref. 1]. Table 10.1 identifies the requirements of the written site safety and health program and project specific requirements that relate to system safety and are relied upon for maintaining the safety envelope.

As identified in Appendix G, *Silo 3 Accident Analysis*, there are no safety class or safety-significant components associated with the Silo 3 Retrieval and Disposition Project. This is based on the fact that Silo 3-initiated accident scenarios do not yield consequences that would exceed on-site dose limits, nor was any mitigation credit taken for these systems, structures, and components in the consequence analysis. However, SBRs and PRs were developed around some components to provide defense-in-depth.

TABLE 10-1: SILO 3 SYSTEM SAFETY REQUIREMENTS

SBR, PR	Requirement	Basis/Source	Implementation
SBR-1	Wall cutting activity, for mechanical retrieval, must be authorized by updated documentation, including but not limited to an Unreviewed Safety Question Determination (USQD) and Operations Work Instructions.	Although consequences are analyzed in this document as EBA-2 (see Appendix G), the wall cutting activity is authorized in the Silo 3 PHAR [Ref. 14] and the work will be done by Construction.	• NS-0002 • Management assessment
PR-1	The Silo 3 stack monitoring capability will be maintained within defined operability parameters, with established action level thresholds and operating limits. Operating data from the particulate filtering system (i.e., pressure differential) can be relied upon during maintenance events on the stacks samplers.	Public and Worker Protection, Environmental Protection Agency (EPA) Required	• 40000-PL-012, *Silos Engineering Project Execution Plan* (i.e. Silos Design Change Notice) • Operations procedures • Routine calibration and maintenance • Routine inspections • Engineering design

TABLE 10-1: SILO 3 SYSTEM SAFETY REQUIREMENTS

SBR, PR	Requirement	Basis/Source	Implementation
PR-2	Individual IP-2 bulk bags shall not be used as primary IP-2 shipping containers if they exceed their specific drop test limits for gross weight.	EBA-4 (App. G) Test Reports for IP-2 Container Testing	Operations procedures • Routine inspections • Engineering design • Routine calibration and maintenance
PR-3	Verify that IP-2 bulk bags/packages are sealed per the IP-2 Container Closure Instructions [Ref. 65] before transfer outside of the Cargo Bay area. If a package is rejected because it cannot be sealed, it may be relocated outside the Cargo Bay area, but only one reject package may be moved at a time.	Shipping requirement EBA-4 (App. G) Test Report for IP-2 Container Testing [Ref. 65] Engineer Evaluation of IP-2 Containers [Rev. 66]	• Operations procedures • Routine inspections • Engineering design • Routine calibration and maintenance
~~PR-4~~	DELETED (SEE DISCUSSION IN SECTION 10.4, *DERIVATION OF SAFETY BASIS REQUIREMENTS AND PROCESS REQUIREMENTS*)	DELETED	DELETED
PR-5	During pneumatic retrieval operations, a vacuum relief valve must be installed on Silo 3, set to −3.0 inches of water, with alarm indication. NOTE: Does not apply to Preliminary Pneumatic Retrieval and Equipment Installation.	Dome Failure, protect Silo Dome TSR	• I-TAB • Routine inspections • Engineering design • Routine calibration and maintenance
PR-6	Preliminary Pneumatic Retrieval and Equipment Installation will be performed per the OWI package as reviewed and approved by an SSA.	Consequences bounded by EBAs in Appendix G: Public and Worker Protection, Containment	• OWI
PR-7	No more than 8 sealed, soft- sided containers may be staged in the ISA or other staging area without being in an ISO.	EBA-6, EBA-7 (App. G) Public and Worker Protection, Containment	• Administrative control
PR-8	ISOs containing Silo 3 materials shall not be stacked more than two high.	EBA-6, EBA-7 (App. G) Public and Worker Protection, Containment	• Administrative control
PR-9	The HVAC and PVS must be operational during direct manual loading.	Public and Worker Protection, Containment	• Administrative control

PCN10 PCN3 PCN8

Identification of the required SBRs and PRs was completed by a team of Silos personnel representing Operations, Quality Assurance, Engineering, Project Safety, and Nuclear and System Safety. Although none resulted in significant radiological consequences, each of the seven EBAs described in Appendix G, as well as Environmental and Operational ALARA details, were considered for potential requirements to protect the Hazard Categorization.

Examination of EBA-1 (hose rupture) did not result in any single component or administrative control that required special protection, as the equipment was of rigorous design and construction, and detection of any spill resulting from hose rupture would be immediate in the occupied facility. Examination of EBA-2 (silo failure due to wall cutting) resulted in SBR-1, to ensure that the work plan for cutting into the Silo 3 wall was documented and implemented with the proper rigor. Examination of EBA-3 (material spill from conveyor) also did not result in any single component or administrative control that required special protection. As was the case for EBA-1, the equipment was of rigorous design and construction, and detection of any spill resulting from conveyor failure would be immediate in the occupied facility.

EBA-4 (package failure during transport to pallet) was examined and two PRs were developed for this scenario. Both PR-2 and PR-3 describe maintaining the bags within the parameters tested for DOT compliance. EBA-5 (filter system failure during retrieval) was examined but did not result in any single component or administrative control that required special protection. This was due to the fact that an abrupt pressure change resulting in filter failure had multiple levels of prevention, and consequences were limited by the immediate loss of ability to pneumatically retrieve. PCN2&10

PRs 1, 4, 5, and 6 were developed to protect parameters outside the EBA scenarios. PR-1 requires capability to measure stack concentration, to meet an environmental release requirement for radon. PR-4 was deleted with PCN3 of this N-HASP. PR-4 required a visual inspection of the fabric boot that sealed the Silo to the pneumatic retrieval system. Initial vacuum wand operation demonstrated that process ventilation at the manway ventilation ring provides adequate airborne containment without use of the boot. Retrieval is less difficult without the boot because operators can directly see the operation. The potential for significant negative pressure within the silo is essentially eliminated without the boot. PR numbering is being maintained to minimize negative impact on referencing procedures. PR-5 protects the TSR for the Silo dome, as it requires the vacuum relief valve to be set properly to prevent underpressurization of the silo that could cause dome collapse. PR-6 is an administrative control that requires review of an Operation Work Instruction (OWI) package for preliminary pneumatic retrieval and equipment installation. PCN3

EBAs 6 and 7 were added when staging of material in the ISA was better defined in the scope of the N-HASP. Two PRs were developed for defense-in-depth of material staging. PR-7 limits sealed bags not contained in an ISO to eight, and PR-8 limits the stacking of the ISOs to two high.

PR-9 was added to ensure that ventilation was available to control airborne contamination during direct manual loading of material. PCN8

11.0 TRAINING REQUIREMENTS

The *Silos Project Training and Qualification Program (TQP) Description*, TQP-067, [Ref. 68] establishes the training and qualification requirements for Silos personnel. The program's objectives are to:

- ensure that workers understand the potential hazards they may encounter.
- ensure that workers possess the knowledge and skills necessary to perform their work with minimal risk to their health and safety.
- ensure that workers are aware of the safety requirements, including the purpose and limitations of safety equipment.
- ensure that workers can safely avoid or escape from emergencies.

The program ensures that workers meet the minimum requirements of 29 CFR 1910.120, DOE Order 5480.20A [Ref. 69] (applicability as described in RM-0043, *FEMP Training Implementation Matrix* [Ref. 70], and other relevant regulations, as applicable.

Health and Safety Training

Workers will receive the appropriate training based on their scope of work. Workers performing activities which fall under 29 CFR 1910.120 [Ref. 71] will receive a required number of hours of initial and annual-refresher health and safety training for hazardous waste site operations. In addition to the initial health and safety training, workers will receive one to three days of directly-supervised field experience.

All personnel performing work under 29 CFR 1910.120 are required to be trained per RM-0055, *FEMP Access* [Ref. 72], in one of the following categories:

- Occasional Site Worker
- General Site Worker

Workers whose work scope does not require hazardous waste site operations training will receive a level of training that is specific to the type of activities to be performed and the hazards to be encountered. Personnel may not participate in field activities until they have been appropriately trained.

Job and Safety Briefings (all hazards)

Before commencement of field activities, all personnel performing fieldwork will participate in a briefing that will specifically address the activities, procedures, monitoring, and equipment used in the work. The briefing will include a description of the work to be accomplished, known hazards (all types), administrative controls, and PPE requirements. This briefing will also allow field workers to receive clarification of anything they do not understand and to confirm their responsibilities regarding safety and operations for their particular activity.