



Department of Energy

**Ohio Field Office
Fernald Closure Project
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Springdale, Ohio 45246
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JUN 23 2005

Mr. Jamie Jameson, Closure Project Director
Fluor Fernald Inc.
P. O. Box 538704
Cincinnati, Ohio 45253-8704

DOE-0270-05

Mr. Jamie Jameson:

CONTRACT DE-AC24-01OH20115, APPROVAL OF THE REVISION OF 40000-HS-0001, TECHNICAL SAFETY REQUIREMENTS DOCUMENT

Reference: Fluor Fernald Inc. letter C:CPD:2005-0051 dated May 26, 2005

The Department of Energy - Ohio Field Office (DOE-OH) and Fernald Closure Project (DOE-FCP) have reviewed your request for approval of the Revision of 40000-HS-0001, Technical Safety Requirements (TSR) Document for the Operable Unit 4 (OU4) Silos to improve As Low as Reasonably Achievable (ALARA) and Project efficiency. Since approval of this TSR Revision would increase the allowable Silo 3 Dome load to 45,000 pounds, DOE-FCP also reviewed the Final Draft of implementing procedure D22-03-001, Revision 12, Silo 3 Dome Access Permit, in consideration of this request.

Based on the above review, this TSR Revision is approved. Within 30 days, Fluor Fernald shall update the Silo 3 Nuclear Health and Safety Plan, (40430-PL-0010, Rev 1, PCN 4) to incorporate the new limits from the revised TSR, 40000-HS-0001, Rev. 5. At a minimum, this action shall include an update of Table 10-2 and associated text in Section 10.3.

Should you have any questions, please contact me at 648-3101 or have your staff contact Bob Everson at 648-3103.

Sincerely,


William J. Taylor
Director

Concurrence:


Robert F. Warther



6001

Mr. Jamie Jameson

-2-

DOE-0270-05

Enclosure: As Stated

cc w/enclosure:

G. Brown, OH/FCP

J. Desormeau, OH/FCP

B. Everson, OH/FCP

J. Reising, OH/FCP

R. Holland, DOE/EMCBC

S. Kawa, DOE/EMCBC

T. Brown, Fluor Fernald, Inc./MS19

P. Fisk, Fluor Fernald, Inc./MS19

D. Sizemore, Fluor Fernald, Inc./MS1

Administrative Record/MS78

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L. Bogar, Fluor Fernald, Inc./MS55

M. Borgman, Fluor Fernald, Inc./MS55

D. Carr, Fluor Fernald, Inc./MS77

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J. Hughes, Fluor Fernald, Inc./MS55

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W. Klein, Fluor Fernald, Inc./MS19

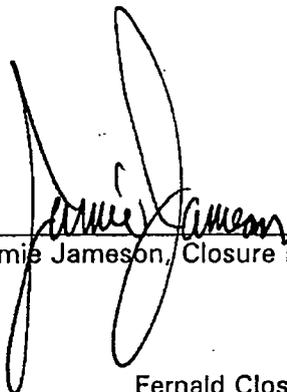
S. Wentzel, Fluor Fernald, Inc./MS55



Technical Safety Requirements Document for the Operable Unit 4 (OU4) Silos

40000-HS-0001
Revision 5

Authorized by:



Jamie Jameson, Closure Project Director

5/26/15

Date

Fernald Closure Project
P.O. Box 538704
Cincinnati, Ohio 45253-5704

ORIGINAL

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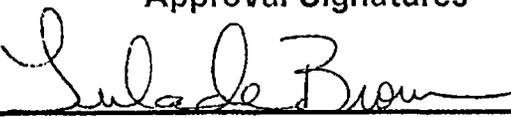
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Record of Issue/Revision

Effective Date	PCN No.	Rev. No.	Description
5/26/98		0	Initial Issue.
5/9/00		1	Revised to include the Technical Safety Requirements identified in the project specific Preliminary Hazards Analysis Reports (PHARs) for the Silos 1 and 2 Accelerated Waste Retrieval Project and the Silo 3 Waste Project.
9/19/03		2	Revised to remove the requirement for fall protection on the Silo domes (USQD-2002-0010), and to document new load limits (USQD-2003-0003). Also removed LCO 3 (permitting enlargement of access ports), because it is superseded by the conditions specified/permitted in revised LCO 1.
02/18/05		3	Revised to change scope of TSR to eliminate applicability to Silo 1 (Silo 1 downgraded to less than nuclear per USQD-2005-0003).
03/10/05		4	Revised to change scope of TSR to eliminate applicability to Silo 2 (Silo 2 downgraded to less than nuclear per USQD-2005-0004).
		5	Revised to change scope of TSR: (1) to make text more Silo 3-specific; (2) to increase the live load limit; (3) to provide a maximum single live load limit; and (4) to combine Zones A and B into a single dome area loading requirement.

Approval Signatures

Approved By:



 Silos Health and Safety Manager

5/17/05⁽¹²⁾

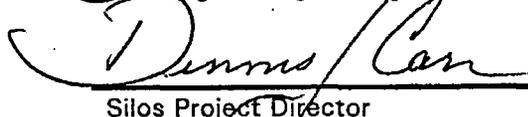
 Date



 Site Engineering Manager

5/19/05

 Date

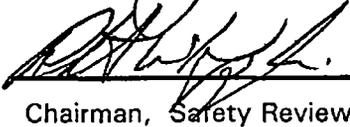


 Silos Project Director

5/19/05

 Date

Authorization Recommended by:



 Chairman, Safety Review Committee

5/19/05

 Date

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Acronyms

AWR	Accelerated Waste Retrieval
DOE	Department of Energy
HC-3	Hazard Category 3
IHA	Integrated Hazards Analysis
LCS	Limiting Control Settings
LCO	Limiting Conditions For Operation
OU4	Operable Unit 4
HAR	Hazard Analysis Report
PHA	Preliminary Hazards Analysis
PHAR	Preliminary Hazards Analysis Report
RCS	Radon Control System
SL	Safety Limits
SBD	Safety Basis Document
SER	Safety Evaluation Report
SSC	Structures Systems and Components
SR	Surveillance Requirements
TSR	Technical Safety Requirements
USQ	Unreviewed Safety Question

1.0 USE AND APPLICATION

NOTE: This TSR originally applied to all OU4 silos (i.e., Silos 1, 2, and 3). It now applies only to Silo 3. The Accelerated Waste Retrieval (AWR) Project for Silos 1 & 2 was completed in 2005. Silo 1 was emptied and residual waste/debris grouted in January; it was downgraded in February; Rev. 3 of this document eliminated TSR applicability to Silo 1 [Ref. 1]. Silo 2 was emptied and residual waste/debris grouted in March; it was downgraded in March; Rev. 4 of this document eliminated TSR applicability to Silo 2 [Ref. 2].

The analyses in the following primary Safety Basis Documents (SBD) provide the safety basis for Silo 3:

- PL-3049, *Implementation Plan for SARs and TSRs at the FEMP* [Ref. 3]
- *Hazards Analysis Report (HAR) for Operable Unit 4 Silos* [Ref. 4]
- *Preliminary Hazard Analysis Report for Silo 3* [Ref. 5]
- *Silo 3 Retrieval and Disposition Nuclear Health and Safety Plan* [Ref. 6]

Authorization for activities within the Silo 3 facilities, as described by these SBD, is provided by the corresponding Safety Evaluation Reports (SERs) [Ref. 7, 8, 9].

Based on the existing authorization basis for the Silo 3 structure, and the technical baseline provided with the preliminary design information of the Silo 3 remedial facilities, the following DOE hazard categorizations are established:

- Silo 3 and its historical supporting activities, as described by the OU4 HAR [Ref. 4], is categorized per DOE-EM-STD-5502-94 [Ref. 10] as Hazard Category 3 (HC-3).
- The Silo 3 Retrieval and Disposition Facility, as described by the Silo 3 N-HASP [Ref. 6], is categorized as Less Than Nuclear.

Historically, the OU4 HAR and the Silo 3 PHAR were developed using the guidance of DOE Order 5480.23 [Ref. 11], which identifies the derivation of applicable Technical Safety Requirements (TSRs) within Chapter 5 of the appropriate SBD. The TSRs are derived from the assessment of the existing TSRs, silo structural analyses, and the safety analyses provided by the OU4 HAR and Silo 3 PHAR. This TSR document presents the safety limits, limiting control settings, limiting conditions for operation, surveillance requirements, and administrative controls for the TSR identified by the hazard analyses.

Two Limiting Conditions of Operation (LCOs) are assigned to Silo 3. Each LCO is meant to protect material confinement integrity. The first LCO establishes appropriate live load limits for the Silo 3 dome. The second LCO requires a Fluor Fernald approved critical lift plan for lifts over Silo 3. The objective of both LCOs is to prevent a partial or total dome collapse.

These LCOs are an extension of the OU4 SBDs because they identify important safety commitments and requirements from the SBDs that are necessary for the safety of personnel, equipment, and the environment, as historically defined by 5480.22 [Ref. 12]. It is the responsibility of the Silos Project management team to implement the LCOs in Silo 3 Project policy, procedures, and practice.

1.1 Definitions

The definitions pertinent to this TSR are listed TABLE 1-1.

TABLE 1-1: DEFINITIONS	
Term	Definition
ACTION	The steps listed in each requirement to be performed by the operators and their supervisors when the specified LIMITING CONDITIONS FOR OPERATION are not met.
ADMINISTRATIVE CONTROLS	The provisions relating to organization, procedures, record keeping, reviews, and audits necessary to ensure safe operation of the project.
COMPLETION TIME	The time allowed to meet an ACTION statement condition.
CONTROL DOCUMENT	A document in which content is maintained for uniformity among the copies by an administrative control system.
FREQUENCY	The time period between SURVEILLANCES.
HAZARD CATEGORY 3 (HC-3)	The hazard category for which the hazard analysis shows the potential for only significant localized consequences.
LIMITING CONDITIONS FOR OPERATION (LCO)	The lowest functional capability or performance level of safety-related Structures Systems and Components (SSCs) and their support systems required for normal safe operation of the project.
LIMITING CONTROL SETTINGS (LCS)	The settings on systems which control process variables to prevent exceeding SAFETY LIMITS (SL).
MODE APPLICABILITY	The operating mode to which an LCO, LCS, SURVEILLANCE, and SL applies.
OPERABLE	The capability of equipment, and all of the supporting components, to perform their intended function.

TABLE 1-1: DEFINITIONS	
Term	Definition
OPERATION	The mission of the facility or its current campaign is being performed.
OPERATIONAL MODE	The modes in which the system may operate.
PREOPERATION	All prestart activities for the project.
RECOVERY PLAN	A plan of action developed to re-establish compliance with procedures or the TSR.
REPAIR	The facility is not able to perform its mission in the current condition.
SAFETY LIMITS (SL)	The limits on process variables necessary for the intended facility to function and which are required to guard against the uncontrolled release of radioactivity and other hazardous material.
SURVEILLANCE REQUIREMENTS (SR)	The requirements relating to test, calibration, or inspection to ensure that the necessary operability and quality of safety related SSCs and their support systems required for safe operation of the facility are maintained.
VERIFY	The affirmation, either physically or numerically, that a specified condition or equipment component is in the defined state.

1.2 Operational Modes

The facility operational modes are shown in **TABLE 1-2**.

TABLE 1-2 OPERATIONAL MODES		
Configuration	Mode	Associated Activities
New Facilities	1. OPERATION: Construction and operation of new Facilities around or adjacent to the HC-3 Silo 3	The presence of personnel and passive, non-invasive, lightweight monitoring equipment on the silo dome. Connection of retrieval system components and monitoring equipment to the silos.
		Lifting, rigging and other suspended work near or directly over the silos.
Current Facilities	1. OPERATION: Inspection and Monitoring	The presence of personnel and passive, non-invasive, lightweight monitoring equipment on the silo dome. Monitoring activities include the installation and operation of cameras.
	2. REPAIR: Silo 3 Dome Maintenance	The presence of personnel and potentially invasive, lightweight maintenance equipment and/or material present on the silo dome to affect routine upkeep of the facility. The presence of personnel and potentially invasive, lightweight maintenance equipment and/or material present on the silo dome to perform maintenance or other work in support of data gathering requirements.

1.3 Frequency Notation

The frequency notations, for possible use in the SRs and ACTIONS, are shown in TABLE 1-3.

TABLE 1-3 FREQUENCY DESCRIPTIONS	
Frequency	Description
IMMEDIATELY	As soon as the operation can be performed in a safe manner (usually not to exceed one hour).
PER SHIFT	At the start of every shift, with a shift defined as a work period not to exceed twelve hours.
DAILY	At least once every 24 hours.

1.4 TSR Violations

A TSR violation occurs under one or more of the following situations:

- a. Failure to establish, implement, or maintain the safety management programs identified in TSR Section 5.0, *Administrative Controls*, as they pertain to the Silos Projects;
- b. Noncompliance with requirements of TSR Section 5.0, *Administrative Controls*, as they pertain to the Silos Projects;
- c. Noncompliance with an LCO by failing to perform the appropriate ACTION in the specified COMPLETION TIME if the LCO is entered; or
- d. Failure to perform a SURVEILLANCE REQUIREMENT at the specified FREQUENCY.

1.5 Mode Applicability

The LCO MODE APPLICABILITY statements in SECTION 3.2 explicitly define the situations to which the LCOs are applicable.

1.6 Limiting Conditions of Operations

LCOs shall be applied as follows:

- a. Compliance with an LCO is required in the modes specified;
- b. Upon failure to meet an LCO, the associated ACTION requirement must be met by the operator, including follow-up ACTIONS;
- c. Failure to meet the specified LCO and its ACTIONS within the specified time interval is considered to be a noncompliance with the requirement;
- d. Restoration of the LCO prior to expiration of the specified interval(s) of the ACTION statement, removes the requirement to complete the ACTION statement.

1.7 Action Requirements

The required ACTION associated with each LCO must be performed within the given COMPLETION TIME.

1.8 Surveillance Requirements

Surveillance requirements related to testing, calibration, or inspection will be met to ensure the following:

- a. The necessary quality of systems or components is maintained,
- b. Facility operation will be within the safety limits, and
- c. Limiting Control Settings and LCOs will be met.

2.0 SAFETY LIMITS

No SAFETY LIMITS are required because the bounding, worst case, unmitigated release of radioactive material has the potential for only significant localized consequences.

3.0 OPERATING LIMITS

3.1 Limit Control Settings

This operation will not require LIMITING CONTROL SETTINGS since no SAFETY LIMITS are specified.

3.2 Limiting Conditions for Operations

Compliance with the LIMITING CONDITIONS FOR OPERATION contained in the succeeding requirements is mandatory at all times during silo project operation.

Noncompliance with a requirement (TSR violation) shall exist when the demands of the LIMITING CONDITIONS FOR OPERATION and associated ACTIONS statements are not met within the specified time intervals. If the LIMITING CONDITION FOR OPERATION is restored prior to expiration of the specified time interval, completion of the ACTION statement is not required.

3.2.1 LCO 1: Silo 3 Load Limits

LIVE LOADS

The following limitations are meant to restrict the live loads placed on Silo 3. These live load values come from Calculation 40430-CA-0029 [Ref. 13].

- Restrict the placement of live AREA LOADS on the Silo 3 dome to a maximum of 45,000 lbs.
- Restrict the placement of live CONCENTRATED LOADS on the Silo 3 dome to a maximum of 2,700 lbs. over a 10 ft² area. Concentrated live loads in excess of this limit require an engineering evaluation.

Notes:

1. Live loads are loads that are superimposed on Silo 3 but that are not permanent and do not include earthquake, earth pressure, or the pressure exerted by the silo contents. Live loads include personnel, and temporary equipment loads.
2. Dead loads are loads that remain in place and include the weight of the structures, equipment, piping, contents, and other permanent loads, including prestressing loads.

DEAD LOADS

- Evaluate all proposed modifications in dead loads applied to Silo 3 with respect to their impact to structural integrity. Final authorization of any changes in dead loads is to be by FLUOR FERNALD.

3.2.1.1 Mode Applicability

Current and New Facilities OPERATION and REPAIR as defined in TABLE 1-2.

3.2.1.2 Actions

Required actions for specific noncompliance conditions are shown in TABLE 3-1.

TABLE 3- 1: LCO-1 ACTIONS		
Condition	Action	Completion Time
The load limit (LCO1) is being exceeded.	Stop operations/place in safe configuration	IMMEDIATELY
	Clear dome area	IMMEDIATELY
	Notify supervisor	IMMEDIATELY

3.2.2 LCO-2: Critical Lift Plans

Approved Critical Lift Plans for hoisting and rigging over the Silo 3 structure shall be required. All lifting shall be performed in accordance with the requirements of RM-0045, *Fluor Fernald Hoisting and Rigging Manual*: Chapter 15 [Ref. 14]; which meets the requirements of DOE-STD-1090-96, *DOE Hoisting and Rigging Manual* [Ref. 15]. All lifting which has potential to breach silo integrity shall be approved by FLUOR FERNALD.

3.2.2.1 Mode Applicability

Current and New Facilities OPERATION and REPAIR as defined in TABLE 1-2.

3.2.2.2 Actions

Required actions for specific noncompliance conditions are shown in TABLE 3-2.

TABLE 3- 2: LCO-2 ACTIONS		
Condition	Actions	Completion Time
Critical lift in process without FLUOR FERNALD documented approval.	Stop operations/place load in safe configuration	IMMEDIATELY
	Clear dome area	IMMEDIATELY
	Notify supervisor	IMMEDIATELY

4.0 SURVEILLANCE REQUIREMENTS

This project will not require SURVEILLANCE REQUIREMENTS. The responsibility for compliance rests with the Facility Manager.

5.0 ADMINISTRATIVE CONTROLS

5.1 Project Specific

The Silos Project Director is responsible for overall unit operation. The Silo 3 Project Manager is responsible for ensuring that the conditions of the LCOs applicable to the Silo 3 Project are met. The Silo 3 Project Facility Owner (or designee) is responsible for LCO field compliance oversight and shall delineate a written method for meeting the silo access requirements established by LCO-1. The Silos Senior Project Director is the person authorized to deviate from this TSR for emergency purposes. There are no other project specific administrative controls required to uphold this TSR.

5.2 Technical Safety Requirement Control

The TSR document shall be controlled under the site document control program. Project specific documentation requirements are addressed in the project-specific Project Execution Plans. Documentation shall be updated as required throughout the course of the project.

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6.0 REFERENCES

1. USQD-2005-0003, *Downgrade of Silo 1, and Revision of 40000-HS-0001, TSRs, to Reflect Downgrade*, Fluor Fernald; January, 2005
2. USQD-2005-0004, *Downgrade of Silo 2, and Revision of 40000-HS-0001, TSRs, to Reflect Downgrade*, Fluor Fernald; March, 2005
3. PL-3049, Rev. 5, *Implementation Plan for Safety Analysis Reports and Technical Safety Requirements at the Fernald Environmental Management Project*, Fluor Fernald; December 3, 2002
4. HAR-97-0028, 40000-RP-0001, *Hazards Analysis Report for Operable Unit 4 (OU4) Silos*, Fluor Fernald; 1998
5. RMR-0445-0056-002, *Preliminary Hazards Analysis Report for Silo 3*, Rocky Mountain Remediation Services, L.L.C. (RMRS); January, 2000
6. 40430-PL-0010, Rev. 1, *Silo 3 Retrieval and Disposition Nuclear Health and Safety Plan*, Fluor Fernald; July 12, 2004
7. 40000-RP-0032, *Safety Evaluation Report for The OU4 Safety Basis Update and Revision to Appendix K OU4 Silos Basis for Interim Operations*, DOE-FEMP; September, 1998
8. 40420-RP-0001, *Safety Evaluation Report for: Silo 3 Project Preliminary Hazards Analysis Report*, DOE-FEMP; February, 2000
9. *Safety Evaluation Report for: Basis for Approval of the Silo 3 Retrieval and Disposition Nuclear Health and Safety Plan*, DOE-FCP, January 14, 2004
10. DOE-EM-STD-5502-94, *Hazard Baseline Documentation*, U.S. Department of Energy; August, 1994
11. DOE Order 5480.23, *Nuclear Safety Analysis Reports*, U.S. Department of Energy; March, 1992
12. DOE Order 5480.22, *Technical Safety Requirements*, U.S. Department of Energy; February, 1992
13. Calculation 40430-CA-0029, Rev. 0, Fluor Fernald; May 4, 2005
14. RM-0045, *Fluor Fernald Hoisting and Rigging Manual*, Fluor Fernald
15. DOE-STD-1090-96, *DOE Hoisting and Rigging Manual*, DOE, 1996

FCP USQ SCREEN

USQD-2005-0006

(Obtain USQD/SE Log number from Document Control [formerly ECDC])

ISSUE TITLE (Enter brief title identifying issue being evaluated):
Revision 5 of the Technical Safety Requirements Document for OU4

FACILITY AND LOCATION (Enter building or facility, including number, where issue exists or issue will be):
Silos Project, Silo 3

AUTHORIZATION BASIS DOCUMENTS & REFERENCE DOCUMENTS (Enter the DOE-approved safety basis documentation such as DSA/HAR/BIO/SER/TSR/SBR/NHASP. Identify additional reference documents. If NO DOE-approved safety documentation exists that addresses the issue, activity or facility, go to NS-0003 to initiate a safety assessment or NS-0008 for SBDR Process) List documents: Document number, revision, title.

- 40000-RP-0028, Rev. 0, Hazard Analysis Report for Operable Unit 4 (OU4) Silos
- RMR-0445-0066-002, Rev.0, Preliminary Hazards Analysis Report for Silo 3
- 40000-HS-0001, Rev. 4, Technical Safety Requirements Document for the Operable Unit 4 (OU4) Silos
- 40430-CA-0029, Revise Silo Dome Loading Limits-TSR Document 40000-H&S-0001

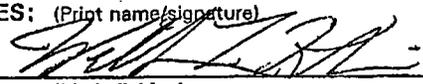
BRIEF DESCRIPTION OF ISSUE (Obtain and present a brief description of the issue to be evaluated. Attach or reference here a copy of the issue package, such as a proposed work plan):

It is proposed that the Technical Safety Requirements specifying live load limits for the Silo 3 dome (LCO 1) be raised to simplify operations. Analyses indicate that Silo 3 can safely support up to 45,000 pounds, with a significant safety margin. The recommended revisions to the TSR LCO 1 are supported in the reference 40430-CA-0029, Revise Silo Dome Loading Limits-TSR Document 40000-H&S-0001, which specifies a safe load limit of 45,000 pounds on the Silo 3 dome. Additional details are documented in the reference, which presents analysis and justification to support raising the current load limits without undo risk.

USQ SCREEN RESULTS SUMMARY

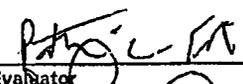
NOTE: If the answers to the questions posed on page 2 of this form are all NO, a USQD/Safety Evaluation is not required; a potential USQ does not exist. A YES answer to any of the questions 1, 3-7 shall require a safety evaluation. If question 1 is answered NO, and question 2 is answered YES, then the issue is excluded from further screening and a safety evaluation is NOT required.

 TSR/SBR Change Required. (Perform a USQD/SE and obtain DOE Approval)
 Safety Evaluation Required. (Question 2 is NO and at least one question 1, 3-7 is YES)
 Safety Evaluation Not Required. (Either item 1 is NO and item 2 is YES, OR all are NO)

SIGNATURES: (Print name/signature)
Bill Klein 

DATE
05-13-05

Technically Responsible Individual

Patricia L. Fisk 

5-13-05

Qualified Safety Evaluator
Tulanda Brown 

5/16/05

Manager, Nuclear & System Safety

FCP USQ SCREEN (cont.)

USQD-2005-0006

USQ SCREEN PREVENTS UNNECESSARY SAFETY EVALUATIONS: (Use NS-0002 to aid determination of responses.)

1. Does this issue change, or add to, the descriptions/discussions or activities of nearby or adjacent facilities/activities addressed in any DOE-approved documented safety analysis?

YES NO Explain (include the number and title of the document being impacted):

The change focuses on load limits for the Silo 3 dome, and therefore, does not change or add to the description/discussions of activities of nearby or adjacent facilities/activities addressed in any DOE-approved safety documentation.

If YES is the answer to Item 1, skip Item 2 (the issue cannot be excluded) and continue the screen.

2. IF the answer to Item 1 is NO, THEN Is this issue Excluded from the USQD/SE System? (GO to NS-0002, Attachment 1):

NO

YES, list the exclusion:

If question 1 is answered NO, and question 2 is answered YES, then the issue is excluded from further screening and a safety evaluation is NOT required. Refer to NS-0002, Section 7.5, for instructions for completing the Results Summary and Signatures blocks. If question 2 is answered NO, continue the screen.

3. Does the issue involve changes to the facility description/discussion, including equipment, operations/activities, and building contents, in the applicable DOE-approved documented safety analysis?

YES NO Explain:

The current TSR discusses a live load limit of 1000/2000 pounds for the silo dome. Therefore, the issue does involve changes to the facility description/discussion, including equipment, operations/activities, and building contents, in the applicable DOE-approved safety documentation.

4. Does the issue involve significant changes to the procedures described in the applicable DOE-approved documented safety analysis? (As a reminder, inconsequential changes such as spelling or typographical corrections, grammatical changes, clarifications, or note references, are not considered significant changes.)

YES NO Explain:

The implementing procedure (D22-03-001) will require significant revision.

5. Does the issue involve tests, experiments, or processes NOT described and considered in the applicable DOE-approved documented safety analysis?

YES NO Explain:

The change is to the dome load limits and does not involve tests, experiments, or processes not described and considered in the applicable DOE-approved safety documentation.

6. Does the issue involve non-radiological hazardous materials NOT described and considered in the applicable DOE-approved documented safety analysis?

YES NO Explain:

The change is to the dome limits and does not involve non-radiological hazardous materials not described and considered in the applicable DOE-approved safety documentation.

7. Could the issue affect nuclear criticality safety in a way NOT previously evaluated?

YES NO Explain:

Criticality is not a concern with the Silos Project.

USQD/SE SUMMARY & EVALUATION

Log No.: USQD-2005-0006

Charge No:	Issue (Project/Activity) Title: Revision 5 of the Technical Safety Requirements Document for OU4		
TR Printed Name: Bill Klein	TR Organization/Project: Silos Project/Safety & Health	TR Phone: 3748	
QSE Printed Name: Patricia L. Fisk	Organization: SH&Q/NSS	Badge No: 10710	
QSE Signature: <i>Patricia L. Fisk</i>	Phone: 7242	Date: 5-13-05	

CONCLUSIONS:

<input type="checkbox"/> Discovered Inadequacy	Change to DOE-approved TSR/SBR?	If YES, enter TSR/SBR document number:	Does Issue Constitute USQ?:
<input checked="" type="checkbox"/> Proposed Activity/Change	YES	40000-HS-0001 Rev.4	YES

SIGNATURES: (Print name/signature)

Tulanda Brown
Manager, Nuclear & System Safety

Tulanda Brown

Date: 5/16/05

If a USQ, SRC REVIEW RESULTS: _____ Concur

Lou Bogar *Lou Bogar* for L.C.B. - AFTER DISCUSSIONS W/
Safety Review Committee Chair *M. Bergman & OTHER SRC MEMBERS.*

Date: 5/19/05

If a USQ, APPROVAL SIGNATURE:

Fluor Fernald Executive Project Director:

Jamie Jameson

Jamie Jameson

Date: 5/20/05

ISSUE DESCRIPTION:

FACILITY AND LOCATION (Enter building or facility, including the number, where issue exists or proposed activity will be. Be as specific as possible.):
Silos Project, Silo 3

AUTHORIZATION BASIS DOCUMENTS (Enter the applicable DOE-approved safety documentation. Identify additional reference documents.):

- 40000-RP-0028, Rev. 0, Hazard Analysis Report for Operable Unit 4 (OU4) Silos
- RMR-0445-0056-002, Rev. 0, Preliminary Hazards Analysis Report for Silo 3
- 40000-HS-0001, Rev. 4, Technical Safety Requirements Document for the Operable Unit 4 (OU4) Silos
- 40430-CA-0029, Revise Silo Dome Loading Limits-TSR Document 40000-H&S-0001

BRIEF DESCRIPTION OF ISSUE (Obtain and present a brief description of the issue to be evaluated, including any potentially affected adjacent systems or facilities. Attach and reference here the USQ Screen AND a copy of the issue package such as: a proposed activity package, a deficiency report, or a discovered inadequacy, reduction of TSR/SBR margin of safety, or unauthorized change description.)

It is proposed that the Technical Safety Requirements specifying live load limits for the Silo 3 dome (LCO 1) be raised to simplify operations. Analyses indicate that Silo 3 can safely support up to 45,000 pounds, with a significant safety margin. The recommended revisions to the TSR LCO 1 are supported in the reference 40430-CA-0029, *Revise Silo Dome Loading Limits-TSR Document 40000-H&S-0001*, which specifies a safe load limit of 45,000 pounds on the Silo 3 dome. Additional details are documented in the reference, which presents analysis and justification to support raising the current load limits without undo risk.

SUMMARY OF SAFETY EVALUATION RESULTS: List in the table the responses to the USQD/Safety Evaluation.

Quest No.	Question	Reference (DS no.)	Response (YES/NO)
1	Could the issue increase the probability of occurrence of an accident previously evaluated in applicable DOE-approved documented safety analysis?	DS-1	NO
2	Could the issue increase the consequences of an accident previously evaluated in applicable DOE-approved documented safety analysis?	DS-1	NO
3	Could the issue increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in applicable DOE-approved documented safety analysis?	DS-1	NO
4	Could the issue increase the consequences of a malfunction of equipment important to safety previously evaluated in applicable DOE-approved documented safety analysis?	DS-2	NO
5	Could the issue create the possibility of an accident of a different type than any previously evaluated in applicable DOE-approved documented safety analysis?	DS-2	NO
6	Could the issue create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in applicable DOE-approved documented safety analysis?	DS-2	NO
7	Does the issue reduce the margin of safety as defined in the basis for any Technical Safety Requirement (TSR) or DOE-approved Safety Basis Requirement (SBR)?	DS-2	YES

Complete the discussion and justification as described in NS-0002, the USQD/SE System procedure. Ensure that the justification for the response is sufficiently detailed and understandable that others, such as members of the SRC, could come to the same response or at least understand why you chose the response you did. This table is an electronic form and will expand to however many number of pages are needed to adequately address the required responses for each question.

Question No. & Response	USQD Questions/ Discussion & Justification
1 NO	<p>Could the issue increase the probability of occurrence of an accident previously evaluated in applicable DOE-approved documented safety analysis?</p>
<p>The accident analyses are documented in Chapter 3 of the OU4 HAR, and Chapter 3 and Appendix G of the Silo 3 PHAR.</p> <p>The Silo 3 Project has twenty-three EBAs, eight associated with Silo 3 and the retrieval facility, ten associated with the treatment facility, and five associated with the Interim Storage Area. Only one of these EBAs is relevant to revising the Silo dome limits: the Structural Failure of Silo 3 due to Natural Degradation, with a frequency category of "anticipated".</p> <p>The analysis in reference 40430-CA-0029 demonstrates that the new TSR limit of 45,000 pounds will provide a safe load limit while improving efficiency of material retrieval. Therefore, increasing the Silo 3 dome limits to the values specified in the reference will not increase the probability of occurrence of an accident previously evaluated in applicable DOE-approved safety documentation.</p>	
2 NO	<p>Could the issue increase the consequences of an accident previously evaluated in applicable DOE-approved documented safety analysis?</p>
<p>The accident analyses are documented in Chapter 3 of the OU4 HAR, and Chapter 3 and Appendix G of the Silo 3 PHAR.</p> <p>The Silo 3 Project has twenty-three EBAs, eight associated with Silo 3 and the retrieval facility, ten associated with the treatment facility, and five associated with the Interim Storage Area. Only one of these EBAs is relevant to revising the silo dome limits: the Structural Failure of Silo 3 due to Natural Degradation.</p> <p>The consequences of these accidents are calculated in their respective safety bases, and are conservatively modeled. The consequence analyses were not dependent on the cause of catastrophic failure; therefore, this issue will not increase the consequences of accidents previously evaluated</p>	
3 NO	<p>Could the issue increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in applicable DOE-approved documented safety analysis?</p>
<p>The Silo Containment Structure is identified in Chapter 4 of the Silo 3 PHAR as the only Safety-Significant Structure. Failure of the Silo Containment Structure is analyzed as SRF-8 in the Silo 3 PHAR.</p> <p>Probability for containment failure is documented in the PHAR to be in the "anticipated" range (less than 1.0E-01 per year but greater than or equal to 1.0E-02 per year). This is already the highest-frequency category. The analysis in reference 40430-CA-0029 demonstrates that the new TSR limit of 45,000 pounds will provide a safe load limit while improving efficiency of material retrieval.</p> <p>Therefore, the issue does not increase the probability of occurrence of a malfunction of safety-significant SSCs nor equipment important to safety previously evaluated in applicable DOE-approved safety documentation.</p>	

4 NO	Could the issue increase the consequences of a malfunction of equipment important to safety previously evaluated in applicable DOE-approved documented safety analysis?
<p>The Silo Containment Structure is identified in Chapter 4 of the Silo 3 as the only Safety-Significant Structure. Failure of the Silo Containment Structure is analyzed as SRF-8 in the Silo 3 PHAR.</p> <p>The consequences of containment failure are calculated for Silo 3 in the safety basis document, and are conservatively modeled. The consequence analyses were not dependent on the cause of catastrophic failure; therefore, this issue will not increase the consequences of a malfunction of equipment to safety previously evaluated.</p>	
5 NO	Could the issue create the possibility of an accident of a different type than any previously evaluated in applicable DOE-approved documented safety analysis?
<p>The accident analyses are documented in Chapter 3 of the OU4 HAR, and in Chapter 3 and Appendix G of the Silo 3 PHAR.</p> <p>The Silo 3 Project has twenty-three EBAs, eight associated with Silo 3 and the retrieval facility, ten associated with the treatment facility, and five associated with the Interim Storage Area.</p> <p>Accident types have been thoroughly analyzed in the safety basis documents, and revision of the silo dome limits will not create the possibility of an accident of a different type than any previously evaluated in applicable DOE-approved safety documentation.</p>	
6 NO	Could the issue create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in applicable DOE-approved documented safety analysis?
<p>The Silo Containment Structure is identified in Chapter 4 of the Silo 3 PHAR as the only Safety-Significant Structure. Failure of the Silo Containment Structure is analyzed as SRF-8 in the Silo 3 PHAR. The Silo 3 dome is already evaluated and protected by the TSR proposed for revision. Therefore, this issue will not create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in applicable DOE-approved safety documentation.</p>	
7 YES	Does the issue reduce the margin of safety as defined in the basis for any Technical Safety Requirement (TSR) or DOE-approved Safety Basis Requirement (SBR)?
<p>The TSR for Silos does not include a "basis" section, and does not define a specific margin of safety for the Silo Load Limits (LCO 1). However, it is understood that the margin of safety is the range above the acceptance limit reviewed and approved by DOE. Since DOE reviewed and approved a dome live load limit of 1000/2000 pounds, raising this limit will reduce the <u>accepted</u> margin of safety. However, the analysis presented in the references demonstrates that the intrinsic margin of safety is sufficient to allow this proposed activity to be performed safely.</p>	

Design Calculation Prepared by Title III
Engineering at the Fernald Closure Project

<h1>CALCULATION COVER SHEET</h1>	Calculation No: 40430-CA-0029	Page: 1 of 5 with Attachment C. S. Hanskat Letter
	Rev. No.: 0	Revision Date: May 4, 2005
	Previous Revision Date: N/A	Current Revision Date: May 4, 2005
Issuing Department: Silos Title III Engineering	Supersedes: N/A	
Client: Fluor Fernald Project Title: Silo 3 Project Project Number: 40430 System:	Engineering Discipline: Structural	
Calculation Title: Revise Silo Dome Loading Limits – TSR Document 40000-H&S-0001		

Purpose:

- Increase the live load limit requirements of TSR 40000-H&S-0001, Revision 2 to more closely reflect the structural capacity of Silo 3. Current configuration of Silo 3 is that the silo structure is protected from the environment (snow and wind loading) by a pre-engineered tension support structure.
- Provide the criteria for a maximum single live load limit that can be placed on the Silo 3 dome without a formal engineering evaluation.
- Combine the Zone A and Zone B loading requirements into a single dome area loading requirement.

Prepared by: <u>Michael J. Borgman</u> <i>M. J. Borgman</i>	Date: <u>April 21, 2005</u>
Checked by: <u>Charles S. Hanskat</u> <i>SEE ATTACHMENT</i>	Date: <u>May 3, 2005</u>
Title III Lead: <u>Jack Hughes</u> <i>J. Hughes</i>	Date: <u>May 4, 2005</u>

Calculation 40430-CA-0029, Revision 0**Proposed Solution****Affected Documents**

40000-H&S-0001 – Technical Safety Requirements Document for the Operable Unit 4 (OU4) Silos

Affected Drawings: None

Scope

- Increase the live load limit requirements of TSR 40000-H&S-0001, Revision 2 to more closely reflect the structural capacity of Silo 3. Current configuration of Silo 3 is that the silo structure is protected from the environment (snow and wind loading) by a pre-engineered tension support structure.
- Provide the criteria for a maximum single live load limit that can be placed on the Silo 3 dome without a formal engineering evaluation.
- Combine the Zone A and Zone B loading requirements into a single dome area loading requirement.

Dome Loading Calculations

The TSR currently divides the dome surface into two distinct areas. Zone A comprises the center 40 feet diameter area of the silo dome. Zone B comprise the remaining area of the silo dome surface.

Current Zone A Load Limits (per TSR)

Maximum Area Live Load of 1000 Pounds on a Minimum Area of 20 Square Feet at Any Two Locations at Least 10 Feet Apart. Area Loads Shall be Approximately Round or Square.

Maximum Annular Live Load of 1000 Pounds at 30 Pounds Per Square Feet Maximum Load Contact Pressure With A Minimum Distance Between Annular Loads of 10 Feet.

Live Loads Applied in Zone A Shall Not Be Combined With the Dome Snow Load of 20 Pounds per Square Feet, or with Any Other Loads.

Current Zone B Load Limits (per TSR)

Maximum Area Live Load of 2000 Pounds on a Minimum Area of 20 Square Feet at Any Four Locations at Least 20 Feet Apart. Area Loads Shall be Approximately Round or Square.

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By: M. J. Borgman

Calculation 40430-CA-0029, Revision 0

Maximum Annular Live Load of 1000 Pounds at 30 Pounds Per Square Feet Maximum Load Contact Pressure With A Minimum Distance Between Annular Loads of 10 Feet.

Live Loads Applied in Zone A May Be Combined With the Dome Snow Load of 20 Pounds per Square Feet.

Current TSR Total Load Limit

Allowable Dome Load, DL + LL (dome ring controls)	738,000 lbs.
Administrative Control Limit, (DL + LL) x 70.1%	517,000 lbs.

Proposed Dome Loading

Dead Loads

Dome Weight = $[4.34'' / 12 \times 5341] \times 150 = 289749$	say 290,000 lbs.
Equipment Dead Load = 4736	say 5000 lbs.
Total Dead Load = $5000 + 290000 =$	295,000 lbs.

Live Loads

Allowable Dome Live Load (Hanskat Calculations)	+130 psf
Snow Load, S (Rubb Structure Covering)	- 0 psf
Wind Load, W (Rubb Structure, Internal Pressure Only)	- 5 psf
Vacuum Pressure, $F = 6'' \text{ water} / 12 \times 62.4 \text{ pcf} = 31.2 \text{ psf}$	~ - 32 psf
Available Dome Live Load Capacity, $130 - 0 - 5 - 32 =$	+93 psf
Available Live Load, by Weight = $93 \text{ psf} \times 5341 \text{ sf} =$	496, 700 lbs.

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By: M. J. Borgman

Calculation 40430-CA-0029, Revision 0**Calculate New TSR Total Load Limit**

Load Magnification Factor for Concentrated vs. Uniform Loading = 2.0

Load Magnification Factor for Unbalanced vs. Distributed Loading = 3.0

Dome Surface Area for 60 Feet Diameter Normal Working Zone = 2922 sf

Available Live Load for 60 Feet Diameter = 93 psf x 2922 = ~ 271,700 lbs.

Proposed TSR Weight Limit = 271700 lbs. / (2.0 x 3.0) = ~ 45,000 lbs.**Calculate the New Administrative Control Limit**

Total Dead Load =	295,000 lbs.
Wind Load = 5 psf x 5341 sf = 26705 lbs.	say 27,000 lbs.
Vacuum Load = 32 psf x 5341 sf = 170912 lbs.	say 171,000 lbs.
Weight Limit =	45,000 lbs.
Proposed Administrative Control Limit =	<u>538,000 lbs.</u>

Calculate New TSR Maximum Concentrated Load LimitBuckling Load Equation: $t = r_d \times [(1.5 \times P_u) / (\phi \times \beta_i \times \beta_c \times E_c)]^{0.5}$

Where t = minimum thickness to resist buckling, 3.8 inches

 P_u = buckling load, 1.4 DL + 1.7 LL r_d = radius of dome, 85 feet ϕ = strength reduction factor, 0.7 β_i = reduction factor for surface imperfections, $(r_d / r_i)^2$ β_c = reduction factor for creep and cracking, $0.44 + 0.003 \times LL$ E_c = modulus of elasticity of concrete, $57000 \times (f'_c)^{0.5}$ f'_c = concrete compressive strength, psi

LL = live load = 32 psf (vacuum pressure)

DL = dead load, $(t/12) \times 150 = (3.8/12) \times 150 = \sim 48$ psf

$$r_i = 1.4 \times r_d \quad \beta_i = (r_d / (1.4 r_d))^2 = 0.51$$

$$\beta_c \leq 0.53 = 0.44 + 0.003 \times 32 = 0.54 > 0.53 \quad \beta_c = 0.53$$

$$E_c = 57000 \times (2800)^{0.5} = 3,016,000 \text{ psi}$$

$$P_u = (\phi \times \beta_i \times \beta_c \times E_c / 1.5) \times (t / r_d)^2$$

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By: M. J. Borgman

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$$P_u = (0.7 \times 0.51 \times 0.53 \times 3016000) / 1.5 \times (3.80 / 85)^2 \approx 760 \text{ psf}$$

$$LL = (P_u - 1.4 \times DL) / 1.7 = (760 - 1.4 \times 48) / 1.7 \approx 407 \text{ psf}$$

Projected Area of Concentrated Load = 10 sf (industry practice)

Total Concentrated Buckling Load = 407 psf x 10 sf = 4070 lbs.

Additional Safety Factor = 1.5

Proposed TSR Concentrated Load Limit = 4070 lbs. / 1.5 ≈ 2,700 lbs.

Summary

The dome load (dead load and live load) on Silo 3 currently is under 5,000 pounds, excluding the dead weight of the dome itself and the operational vacuum pressure maximum. The dome load includes, the platforms, equipment, piping, hoses, and Silo 3 material. The live load due to personnel is generally under 1,000 pounds.

The TSR area load limits were initially established from the calculations prepared by Parsons in 1995 (document 40000-CA-0001). Dome analysis was also performed by Fluor Daniel Irvine in 1998 (40000-CA-0002) and Charles Hanskat in 2002.

An administrative control load limit of 517,000 pounds was established from an allowable load of 738,000 pounds, derived from the capacity of the pre-stressed wires at the dome's tension ring for the Silo 1 and Silo 2 dome design. The new administrative control limit of 538,000 pounds is even more conservative as the tension ring design of Silo 3 is more robust.

The new TSR load limit of 45,000 pounds will provide a safe loading limit for Silo 3 while improving the efficiency of the material retrieval operation. An upper concentrated load limit of 2,700 pounds without engineering evaluation will provide flexibility to the Silo 3 operation and will ensure that the structural integrity of the silo structure is maintained. As delineating separate zoned areas on the Silo 3 dome has no engineering grounding or functional value, the single zone concept provides less confusion and will significantly improve the dome access management process.