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RISK MANAGEMENT PLAN FOR OPERABLE UNIT 4 SILOS 1 & 2 (K-65) REMOVAL ACTION SEPTEMBER 11, 1991

09/11/91

PH&A-PM4-91-406
WEMCO/DOE-FN
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REPORT
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- 5349

RISK MANAGEMENT PLAN

for

OPERABLE UNIT 4 SILOS 1 & 2 (K-65) REMOVAL ACTION

prepared by

Westinghouse Environmental Management Company of Ohio

for

U.S. DEPARTMENT OF ENERGY/FERNALD SITE OFFICE

SEPTEMBER 11, 1991

RMP No. PM&A-PM4-91-406

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RISK MANAGEMENT PLAN

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RMP NO. PM&A-PM4-91-406

OPERABLE UNIT 4 SILOS 1 & 2 (K-65) REMOVAL ACTION

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OPERABLE UNIT 4 SILOS 1&2 (K-65) REMOVAL ACTION

RISK MANAGEMENT PLAN

INTRODUCTION

This Risk Management Plan (herein referred to as the "Plan") is intended to describe the specific actions and responsibilities to mitigate or eliminate the consequences of failure or concern identified in the Risk Assessment Report, titled "Silos 1 & 2 (Bentonite Application)" and approved for this project.

SUMMARY

The (K-65) Removal Action Project involves 22 potential failures or concerns that merit special management attention due to the severity of their consequences.

These consequences can be managed, minimized, or eliminated by close adherence to the risk control measures identified. Specific control measures directed by management and implemented by pertinent personnel provide the effective risk control and/or mitigation required. This plan specifies the control and mitigation for the management of risk associated with this effort.

RISK REQUIRING INCLUSION IN THE PLAN

The Risk Assessment Report (RAR) identifies 22 possible failures or concerns (risks) associated with the Removal Action Project that merit special management attention. Sixteen (16) concerns are identified as Quality Level 2, and the other six are identified as Quality Level 3. These concerns are listed below:

QUALITY LEVEL 2

1. **Crane failure impacts dome.**
2. **Personnel fall into silo.**

3. Dropped equipment impacts dome or personnel.

4. Fire or explosion occurs while refueling crane engines.

5. Training/certification of involved personnel not performed.

6. Overhead power lines present shock hazard to mobile crane.

7. No sway control for crane boom during periods of high winds.

8. Lightning protection not provided for personnel on silo domes.

9. Lightning protection and grounding network are not utilized for equipment.

10. Rigging devices for crane may fail, ie., slings, shackles, eyebolts, cables, etc.

11. Emergency eye wash and shower are neither accessible nor approved for personnel safety.

12. Fire or explosion results from improper handling/storage of flammable and combustible liquids.

13. Temporary electrical equipment presents electrical hazards due to incorrect installation.

14. Crane safety features are not operational or are incorrectly set, ie., brakes, horn, stops and load limiter devices.

15. Radon Treatment System (RTS) not operated to reduce radon levels to less than 75 mr/hr prior to performing work on silos.

16. Noise level from Bentonite slurry mixer tank motors, spray head assembly or other equipment exceeds the 85 db limit set by OSHA.

QUALITY LEVEL 3

1. Spray head assembly not stabilized during insertion or operation.

2. Foundation/pad for bentonite mixing and supply system settles/cracks.

3. **Personnel qualified for maintenance and calibration of equipment unavailable.**

4. **Bentonite spray head is energized above dome or during insertion through manhole.**

5. **Personnel other than those designated are permitted to operate crane. Crane operated by unqualified personnel.**

6. **Placement of lighting fixtures for outdoors location does not provide sufficient dispersion to eliminate dark areas.**

DESCRIPTION OF CONTROLS, MITIGATORS, AND REQUIREMENTS

1. GENERAL RISK CONTROLS, MITIGATORS, AND REQUIREMENTS

All design, pre-construction planning, and inspections shall be accomplished in accordance with the following written procedures, regulations and instructions:

A. National Electric Code, 1990 Edition or Later

B. FMPC-719 Energy Control

C. FMPC Site Policies and Procedures

D. FMPC-2201 Project Management Procedures

E. DOE 6430.1A

F. OSHA Standards

G. DOE Hoisting and Rigging manual

The Work Plan and procedures contained in the Project Specific Health and Safety Plan for the "Silos 1 & 2 (K-65 Silos) Removal Action detail the normal activities expected during the subcontract effort. The guidance, procedures and regulations above provide details for addressing the potential failures or concerns identified.

Specific activities which address the identified risk as listed in **Risk Requiring Inclusion In The Plan** section on Page 3 are as detailed below:

A.1 A-E design review verifies calculations for materials satisfy load requirements, and establishes testing requirements for crane proof load and safety procedures based on manufacturer's instructions. Industrial standards, and WEMCO OSHA requirements (IHS-6-10). Title III Engineer verifies requirements are not in the field.

A.2 A-E specifies that no more than three personnel or maximum live load of 700 lbs on silos and no loading or access permitted within a 10 foot radius of silo center.

A.3 Crane inspections are required per IHS-S-10 and the DOE Hoisting and Rigging manual. Subcontractor performs inspection. Title III Engineer verifies test and inspections are performed.

A.4 A-E design reviews verify NFPA-30 code for flammable and combustible liquids. Refueling precautions specified in ANSI A10.5, Para. 16.16. IH&S verifies compliance with requirements.

A.5 Training requirements are developed at beginning of project, and implemented prior to start.

A.6 A-E design review verifies clearance between energized electrical line and crane per 29 CFR 1910.180, para.j and IHS-S-10.

A.7 A-E design review verifies boom sway control. Title III engineer verifies installation and testing.

A.8 A-E design review verifies lightning protection & structural grounding specifications conform to the requirements in DOE 6430.1A, section 1630-5 and 1639, and NFPA 78 and 70, respectively.

A.9 Safety and fire protection engineering determines the location and quantity of emergency eye wash and shower stations based on ANSI Z358.1.

A.10 A-E design review verifies NFPA-30 code for handling and storage of flammable and combustible liquids. Industrial health and safety verifies compliance with requirements.

A.11 A-E design verifies sufficiency of electrical drawings submitted. Electrical contractor inspects and tests installation.

A.12 A-E establishes settings and test requirements for crane safety features based on manufacturer's instructions. Subcontractor makes settings and performs tests. Title III engineer shall verify testing is performed.

A.13 Radiological safety performs daily area surveys for sources of contamination levels and posts work restrictions at area entrances per OSH-P-35-017. Area supervisor authorizes work only after RTS brings radon level below 75 mr/hr. Area supervisor initiates work permit per FMPC-515 for controlled

access.

A.14 A-E specifies that equipment shall meet 85 db criteria to comply with OSHA 1910.95, IH&S-IH-06, and that vendors shall submit sound level data.

A.15 A-E design review verifies sway control for spray head during insertion and stability during operation. Title III engineer verifies installation.

A.16 A-E design review verifies foundation pad is designed to support load of operating bentonite supply system.

A.17 Maintenance engineering utilizes FMPC-102 to implement training for its personnel as determined by its operating requirements.

A.18 Supervisor verifies that spray head is not energized until inside silo in position to distribute Bentonite. Title III engineer verifies that spray head de-energized until ready to operate.

A.19 A-E establishes requirements for crane safety based on the requirements of OSHA 1910.160 and WEMCO IHS-S-10, which specifies that only trained and authorized personnel shall operate cranes.

A.20 A-E designs facility lighting to the requirements of the design criteria, the guidelines of DOE 6430.1A, section 1650/1, and manufacturer's recommendations, minimum illumination per CFR 1910.120 (m).

TRAINING

The special training requirements are listed in The Project Specific Health and Safety Plan and are as follows:

- Review of this health and safety plan for this work including site specified hazards and procedures. (The safety meeting(s) will be documented.)
- Four Hour Radiation Worker Training.
- When applicable, proof of respirator training, qualitative fit testing and recent medical examination with medical certification are required. All documentation must be current to within one year and any equivalent training must be approved by site Industrial Hygiene.
- Site nuclear criticality training (Criticality Training).

- OSHA 29 CFR 1910.120 40 hour training for hazardous waste site worker.
- 8-hour annual refresher training, required after 365 days of completing OSHA 29 CFR 1910.120 40 hour training.
- Anti-C Training, specifically for suits and respiratory equipment used on this project.
- FMPC-719 " Emergency Control Procedure" 2-15-91
- OSHA 29 CFR 1910.120 (c) (u) - 8 hour supervisor training.
- 8-hour supervisory training (for supervisors)
- 24-hour supervised field experience
- FMPC site orientation video
- FMPC K-65 Silos Number 1 & 2 Area Emergency SOP 65-C-201.
- Operational Procedures which will include:

*startup

*normal operations

*normal shutdown

*restart after normal
*operations shutdown

*routine maintenance

*preventive maintenance

*emergency shutdown

*restart after emergency shutdown

*dismantling and removal

*equipment decontamination and removal

ATTACHMENTS

1. Risk Assessment Report, "Silos 1 & 2 (Bentonite Application)," dated 9-3-91.

WEMCO, INC.
RISK ASSESSMENT REPORT
FMPC - 712, RO
WP0000.D00

TITLE: Silos 1 & 2 (Bentonite Application)
WBS NUMBER: 1.2.1.4.2.1
LOCATION: Operable Unit 4 - K65
Silos Removal Action

DATE: September 3, 1991
REVISION NUMBER: R0

RISK MGMT. PLAN NO.		
DIV	DEPT	SEQ

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 1	5	*NOTE: All Abbreviations are defined under "NOTES" of the last page.*					
Temporary electrical equipment presents electrical hazard due to incorrect installation.		Possibility of electrical shock could result from incorrectly installed electrical equipment causing injury or death.	Insufficient design details or inadequate inspection or testing during installation. Inadequate periodic maintenance.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** Local **Estimated $ Loss:** < 500,000 Fatal personnel injury. Unavailability of equipment due to electrical outage.	A-E design review verifies sufficiency of electrical drawings. Electrical contractor inspects and tests installation. Title III engineer verifies inspection and testing performed. Electrical contractor performs periodic inspection and maintenance.	4	2
ITEM 2	3						
Placement of lighting fixtures for outdoors location does not provide sufficient dispersion to eliminate dark areas.		Accident rate increases in poorly lit traffic and work areas. Tripping hazard.	Lighting requirements not verified or adjusted during dark hours after installation.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 50,000 Possibility of accident in poorly lit traffic or work area.	A-E designs facility lighting to the requirements of the design criteria, the guidelines of DOE 6430.1A, section 1650-1, and manufacturer's recommendations, minimum illumination per 29 CFR 1910.120(m). Title III engineer to verify lighting effectiveness after installation. Electrical contractor performs periodic maintenance.	4	3

Seriousness/Probability		Quality Level-Action
Negligible	= 1	1 - Risk Management Plan
Low	= 2	2 - Risk Management Plan
Moderate	= 3	3 - QA Inspection/Test Verification
High	= 4	4 - None Required
Very High	= 5	

Preparer

REF: Silo 1 & 2 (K-65) Silos Removal Action Plan - FMPC dated 11/19/90, transmitted by WMCO letter: P:90-711, dated 11/1/90.

Project Engineer | Facility Owner | Industrial, Radiological Safety and Training (IRS&T) | Site Wide Quality Assurance | Project Management

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POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 3	2					3	4
Bentonite slurry pump exhibits noticeable vibrations leading to premature pump failure.		Partial loss of process operation will result from premature pump failure if vibrations remain uncorrected.	Pump inspection not performed after installation, or mounting and alignment requirements were not provided by the manufacturer. Poor maintenance. Cavitation due to extended operation at low NPSH.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** DOE **Estimated $ Loss:** < 50,000 Partial process shutdown and pump repairs required to correct broken shaft, pump casing, or impeller. Delay in scheduled completion.	Pump mounting and alignment requirements are specified by the manufacturer at the time of purchase. Installation and testing is verified by Title III engineer. Subcontractor performs periodic maintenance.		
ITEM 4	3					3	3
Foundation/pad for bentonite mixing and supply system settles/cracks.		Damage to mixing and supply system. Improper operation of equipment. Possible toppling of system.	Foundation/pad not adequately designed. Subsurface condition which could cause cave-in not identified.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 500,000 Personnel injury. Equipment damage. Delay in scheduled completion.	A-E design review verifies foundation/pad is designed to support load of operating bentonite supply system. A soil boring and geotechnical report is prepared for site excavation requirements. Title III engineer verifies foundation/pad is inspected and tested per design requirements.		
ITEM 5	1						
Obsolete or abandoned material/equipment not identified or removed per FMPC-720.		N/A	N/A	**Radionuclide Release:** Yes ( ) No ( ) **Notoriety:** **Estimated $ Loss:** N/A	N/A		
		Removal of construction and hazardous wastes is an ongoing safety and efficiency consideration which is addressed by the FMPC-720. Note: FMPC-712 does not require RAR development beyond column 1 when "seriousness" is scored with a (1).					

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 6	4					5	2
Training/certification of involved personnel not performed.		Safety of personnel jeopardized. Equipment damage more likely to occur. Loss of production.	Program for training/certifying personnel not implemented by responsible management.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 500,000 Personnel injury. Equipment damage. Impact on schedule.	Training requirements are developed at beginning of project and implemented prior to start. Management verifies training/certification per FMPC-102 and 29 CFR 1910.120. Rust performs training for contractor/sub-contractor personnel. WEMCO performs training as required for WEMCO personnel.		
ITEM 7	1						
Covers or guards for rotating equipment left off or omitted.		N/A	N/A	**Radionuclide Release:** Yes ( ) No ( ) **Notoriety:** **Estimated $ Loss:** N/A	N/A		
		Covers or guards for exposed belt or shaft drives are standard supply by manufacturers or suppliers of approved equipment. The requirement is based on OSHA 29 CFR 1910.219 (i)(2). Note: FMPC-712 does not require RAR development beyond column 1 when "seriousness" is scored with a (1).					
ITEM 8	4					3	3
Personnel qualified for maintenance and calibration of equipment unavailable.		Equipment cannot be maintenance on a scheduled basis. Scheduled maintenance cannot be performed with inadequately trained personnel.	Program for training and qualification of personnel was not implemented by maintenance engineering.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 500,000 Equipment failures may result. Operational status of the system will be impacted.	Maintenance engineering utilizes FMPC-102 to implement training for its personnel as determined by its operating requirements. Rust performs training for Rust personnel. Sub-contractor will train WEMCO personnel.		

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 9	4					4	2
Noise level from Bentonite slurry mixer tank motors, spray head assembly or other equipment exceeds the 85 db limit set by OSHA.		Personnel may unknowingly experience noise levels which exceed 85 db causing permanent hearing loss or severe damage.	Ineffective noise abatement in source areas, I.E., mixer tank motors, spray head assembly or other equipment.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 50,000 Sustained exposure of personnel without hearing protection may result in permanent hearing loss.	A-E specifies that equipment shall meet 85 db criteria to comply with OSHA 1910.95, IH&S-IH-06, and that vendors shall submit sound level data. Industrial Hygiene and Safety verifies compliance of worker safety to OSHA requirements which include periodic testing of area for less than 85 db noise levels.		
ITEM 10	4					4	2
Lightning protection and grounding network are not utilized for equipment.		Equipment and personnel are unprotected from severe electrical shock during and electrical storm. Personal injury.	Requirements for lightning protection and structural grounding were not included in the equipment layout and electrical design, or were not installed during construction.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 500,000 Random lightning strikes on metal structures can cause serious structural damage and electrical flashovers in vicinity of personnel causing injury.	A-E design review verifies lightning protection & structural grounding specifications conform to the requirements in DOE 6430.1A, section 1630-5 and 1639, and NFPA 78 and 70, respectively. Title III engineer verifies installation is inspected and tested. Area supervisor initiates a work request to electrical maintenance to periodically inspect lightning and grounding systems per FMPC-715.		
ITEM 11	5					4	2
Overhead power lines present shock hazard to mobile crane.		Crane operators and other personnel may receive severe shock resulting in injury or death.	Crane operators not aware of energized overhead electrical power lines. A-E did not obtain requirements from industrial hygiene and safety relative to required clearance between cranes and energized electrical power lines.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** Local **Estimated $ Loss:** <500,000 Potential for serious or fatal injury. Equipment damage. Schedule impact.	A-E design review verifies clearance between energized electrical line and crane per 29 CFR 1910.180, PARA.j and ISH-S-10. IH&S verifies compliance. WEMCO management/supervision instruct crane operators of requirements of IHS-S-10. Any accident or property damage shall be reported immediately.		

WEMCO, INC.
RISK ASSESSMENT REPORT
FMPC - 712, RO
WP0000.D00

TITLE: Silos 1 & 2 (Bentonite Application)
WBS NUMBER: 1.2.1.4.2.1
LOCATION: Operable Unit 4 - K65
Silos Removal Action

DATE: S nber 3, 1991
REVISION NUMBER: R0

RISK	IT. PLAN NO.	
DIV	DEPT	SEQ

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 12	5					3	2
Personnel fall into silo.		Fatal personnel injury may result from fall. Untreated radon gas release to atmosphere. Excessive radiological exposure.	Dome will not support weight of personnel and equipment. Miscalculation of weight which dome will support. Degradation of silo domes worse than predicted.	**Radionuclide Release:** Yes (X) No ( ) **Notoriety:** National **Estimated $ Loss:** < 1,000,000 Release of untreated radon gas. Fatal personnel injury. Serious delay in scheduled completion. Excessive radiological exposure to personnel.	A-E specifies no more than three personnel or maximum live load of 700 pounds on silos, and no loading or access permitted within a ten foot radius of silo center. A-E specifies that operations involving manway removal/replacement, camera installation, etc. be performed by personnel in crane basket to eliminate live load on silo. Industrial health and safety verifies compliance with requirements.		
ITEM 13	4					4	2
No sway control for crane boom during periods of high winds.		Personnel, equipment and structures are unprotected from injury/damage resulting from crane boom sway.	A-E does not consider boom sway prevention.	**Radionuclide Release:** Yes (X) No ( ) **Notoriety:** Local **Estimated $ Loss:** < 100,000 Personnel injury. Equipment damage. Possible release of radioactive material if damage to silo occurs. Delay in scheduled completion.	A-E design review verifies boom sway control. Title III engineer verifies installation and testing.		
ITEM 14	2					4	4
Roadway gives way under weight of crane or Bentonite supply trucks.		Damage to crane or truck. Possible injury to personnel.	Roadway not designed to support heavy equipment. Underground trenching or erosion causes weak areas in roadway.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** <100,000 Personnel injury. Equipment damage. Delay in scheduled completion.	A-E design review verifies roadway is capable of supporting weight of crane and bentonite supply truck (22.5 tons). Title III engineer verifies load testing is performed.		

WEMCO, INC.
RISK ASSESSMENT REPORT
FMPC - 712, RO
WP0000.D00

TITLE: Silos 1 & 2 (Bentonite Application)
WBS NUMBER: 1.2.1.4.2.1
LOCATION: Operable Unit 4 - K65
Silos Removal Action

DATE: : mber 3, 1991
REVISION NUMBER: R0

RISK		AT. PLAN NO.
DIV	DEPT	SEQ

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 15	5					4	2
Crane safety features are not operational or are incorrectly set, I.E., brakes, horn, stops, and load limiter devices.		Faulty operation of safety features could result in potential death, personnel injury, equipment breakage, or spilled material.	A-E does not establish settings or test requirements for safety features during design, or testing not performed after installation.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** National **Estimated $ Loss:** < 100,000 Potential death. Personnel injury. Equipment damaged. Dropped or spilled material. Damage to dome will interrupt envelope for radon control.	A-E establishes settings and test requirements for crane safety features based on manufacturer's instructions. Sub-contractor makes settings and performs tests. Title III engineer to verify testing is performed.		
ITEM 16	4					4	2
Emergency eye wash and shower are neither accessible nor approved for personnel safety.		Untreated contamination to eyes and skin of personnel may result in blindness and severe damage to skin.	A-E design drawings did not specify ANSI approved equipment. Inspection requirements were not specified at time of receipt. Equipment was not verified after installation.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 100,000 Delayed or inadequate treatment may result in personnel injury.	Safety and fire protection engineering determines the location and quantity of emergency eye wash and shower stations based on ANSI Z358.1. A-E design review verifies the emergency wash stations are specified per the ANSI requirements. Title III engineer verifies installation and testing are performed per CFC drawings. Utilities management maintains the wash stations through weekly inspection and testing per SOP 43-C-301.		
ITEM 17	4					3	3
Personnel other than those designated are permitted to operate crane. Crane operated by unqualified personnel.		Safe operation of crane would be left to chance if undesignated personnel were permitted to operate crane. Possible personnel injury. Equipment/structure safety jeopardized.	Lack of adequate supervision.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** Local **Estimated $ Loss:** < 100,000 Personnel and equipment/structure safety may be jeopardized by operators with untested skills.	A-E establishes requirements for crane safety based on the requirements of OSHA 1910.160 and WEMCO ISH-S-10 which specifies that only trained and authorized personnel shall operate cranes. Verification of compliance with these requirements is the responsibility of Rust.		

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 18	5					3	2
Crane failure impacts dome.		May lead to dome collapse causing release of untreated radon gas to atmosphere, fatal personnel injury, and/or equipment damage.	Rated load capacity exceeded. Crane is not leveled within 1% grade. Non-designated personnel operating crane. Inadequate inspection or maintenance. Wind loads. Operational error.	**Radionuclide Release:** Yes (X) No ( ) **Notoriety:** National **Estimated $ Loss:** < 500,000 May cause fatal personnel injury. Equipment/structure damage. Excessive radiological exposure to personnel. Delay in schedule.	A-E design review verifies calculations for materials satisfies load requirements, and establishes testing requirements for crane proof load and safety features based on manufacturers instructions, industrial standards, and WEMCO OSHA requirements (IHS-6-10). Title III engineer verifies requirements. Sub-contractor performs periodic inspection and maintenance.		
ITEM 19	5					4	2
Fire or explosion occurs while refueling crane engines.		Potential death or serious injury including severe burns. Damage to equipment.	Flame or spark producing devices in close proximity while refueling. Personnel smoking or lighting smoking material in area.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** Local **Estimated $ Loss:** <500,000 Potential death/serious injury. Damage to equipment delay in scheduled completion.	A-E design review verifies NFPA-30 code for flammable and combustible liquids. Refueling precautions specified in ANSI A10.5, PARA. 16.16. IH&S verifies compliance with requirements.		
ITEM 20	5					4	2
Fire or explosion results from improper handling/storage of flammable and combustible liquids.		Potential death. Injury including severe burns to personnel. Damage to structures and equipment.	Improperly stored flammables and combustibles. Leaking or spills from fuel containers. Flame, spark producing devices, or lighted smoking material in storage area.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** DOE **Estimated $ Loss:** < 500,000 Injury to personnel. damage to equipment/structures. Delay in scheduled completion of project.	A-E design review verifies NFPA-30 code for handling and storage of flammable and combustible liquids. Industrial health and safety verifies compliance with requirements.		

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 21	5					3	2
Rigging devices for crane may fail, I.E. slings, shackles, eyebolts, cables, etc.,		Possible fatal personnel injury. Damage to equipment and structures. Release of radioactive material.	Inspection and testing provisions not established. Devices not inspected and tested prior to use. Improper use of devices.	**Radionuclide Release:** Yes (X) No ( ) **Notoriety:** National **Estimated $ Loss:** < 500,000 Fatal personnel injury. Equipment damage. Structural damage to silos. Schedule delay due to damage.	Crane rigging devices shall be inspected per IHS-D-10 and the DOE hoisting and rigging manual. Sub-contractor performs inspection and tests. Title III engineer verifies tests and inspections are performed.		
ITEM 22	5					3	2
Dropped equipment impacts dome or personnel.		Possible fatal personnel injury. Damage to equipment/structures. Release of radioactive material.	Crane inspection program not established. Operational error.	**Radionuclide Release:** Yes (X) No ( ) **Notoriety:** National **Estimated $ Loss:** < 500,000 Possible fatal personnel injury, equipment/structure damage, potential for personnel exposure beyond ALARA limits. Delay in schedule.	Crane inspection per ISH-S-10- and the DOE hoisting and rigging manual. Sub-contractor performs inspection. Title III engineer verifies tests and inspections are performed.		
ITEM 23	1						
Fuel or lubricant spills.		N/A	N/A	**Radionuclide Release:** Yes ( ) No ( ) **Notoriety:** **Estimated $ Loss:** N/A	N/A		
		CERCLA and RCRA requirements provide means to determine impact and cleanup and disposition relative to volume. Note: FMPC-712 does not require RAR development beyond column 1 when "seriousness" is scored with a (1).					

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
ITEM 24	5					4	2
Lightning protection not provided for personnel on silo domes.		Potential for fatal or serious injury.	The requirement for lightning protection was not included in the electrical drawings by the A-E were not installed during construction.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** Local **Estimated $ Loss:** <500,000 Potential fatal or serious injury. Schedule impacted.	A-E design review verifies lightning protection in accordance with NFPA-78. Inspection verifies installation inspected and tested per CFC drawings.		
ITEM 25	3					3	3
Bentonite spray head is energized above dome or during insertion through manhole.		Possible personnel injury. Equipment/structures may be damaged.	Spray head not locked out during transient to dome or insertion into manhole.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 100,000 Personnel injury. Equipment damage. Structural damage to silo. Schedule impacted.	Supervisor verifies that spray head is not energized until inside silo in position to distribute Bentonite. Title III engineer verifies that spray head is de-energized until ready to operate.		
ITEM 26	3					3	3
Spray head assembly not stabilized during insertion or operation.		Possible personnel injury. Equipment/structures (Silo and manway) may be damaged.	A-E does not consider sway control for spray head during insertion or stability during operation.	**Radionuclide Release:** Yes ( ) No (X) **Notoriety:** WEMCO **Estimated $ Loss:** < 100,000 Personnel injury. Equipment damage. Structural damage to silos. Schedule impacted.	A-E design review verifies sway control for spray head during insertion and stability during operation. Title III engineer verifies installation.		

WEMCO, INC.
RISK ASSESSMENT REPORT
FMPC - 712, RO
WP0000.D00

TITLE: Silos 1 & 2 (Bentonite Application)
WBS NUMBER: 1.2.1.4.2.1
LOCATION: Operable Unit 4 - K65
Silos Removal Action

DATE: S. .ıber 3, 1991
REVISION NUMBER: R0

RISK .	.T. PLAN NO.	
DIV	DEPT	SEQ

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL
Item 27	4					4	2
Radon Treatment System (RTS) not operated to reduce radon level to less than 75 mr/hr prior to performing work on silos.		Radiation exposure to personnel on silos exceeds ALARA program as established by FMPC-2084, Section 4-1.	Work activity not authorized. Radiation work permit not initiated. Radiation work permit and/or procedure does not require operation of RTS. Lack of training for Zone III activities.	Radionuclide Release: Yes (X) No ( ) Notoriety: Local Estimated $ Loss: <100,000 Exposure of personnel to radiation source due to inadequate control in Zone III area. Minor event report required. Schedule delay.		Radiological safety performs daily area surveys for sources of contamination levels and posts work restrictions at area entrances per OSH-P-35-017. Radiological safety also monitors area for contamination levels which may build up in excess of 100 MR/HR. Area supervisor authorizes work only after RTS brings radon level below 75 mr/hr. Area supervisor initiates work permit per FMPC - 515 for controlled access. Rust performs training for contractor/sub-contractor personnel. WEMCO performs training as required for WEMCO personnel. Radiological safety surveys area to verify enforcement or work restrictions.	

POSSIBLE FAILURE/CONCERN	SERIOUSNESS CODE	SERIOUSNESS RATIONAL	POSSIBLE CAUSE OF FAILURE/CONCERN	EFFECT OF FAILURE/CONCERN	NORMAL STANDARDS OR PROCEDURES TO ELIMINATE OR MINIMIZE A FAILURE/CONCERN	PROBABILITY CODE	QA LEVEL

NOTES:

A-E: Architect Engineer
ALARA: As Low as Reasonable Achievable
ANSI: American National Standards Institute
ANSI A10.5: American National Standard Safety Requirement for Material Hoists
ANSI Z358.1: American National Standard for Emergency eyewash and shower equipment
CESHWS: Construction Environmental Safety and Health Work Survey (PMP-420
CFC: Certified for Construction Drawings
CFR: Code of Federal Regulations
CWID: Construction Waste Identification/Disposal (FMPC-720)
DC: Design Criteria
DOE: Department of Energy
DOE 6430.1A: General Design Criteria
DOE Hoisting and Rigging Manual
FMPC: Feed Materials Production Center
FMPC-102: Training
FMPC-515: Radiation Work Permit
FMPC-712: Vulnerability and Risk Assessment and Management
FMPC-715: FMPC Work Request System
FMPC-720: Control of Construction Waste
IES: Illuminating Engineering Society
IH&S: Industrial Hygiene and Safety (Part of IRS&T)
IH&S-IH-06: Hearing Conservation
IHS-S-10: Crane, Hoist and Rigging Practices
IHS-S-14: Safety Requirements for Working at Elevated Locations
NFPA: National Fire Protection Association
NFPA-30: Flammable and combustible Liquids Code
NFPA-70: National Electric Code
NFPA-78: Lightning Protection Code
NPSH: Net Positive Suction Head
OSHA: Occupational Safety and Health Administration
OSHA 1910.95: Occupational Noise Exposure (29 CFR 1910)
OSHA 1910.120: Hazardous Waste Operations and Emergency Response (29 CFR 1910)
OSHA 1910.180: Crawler Locomotive and Truck Cranes (29 CFR 1910)

NOTES:

OSH: Occupational Safety and Health
PE: Project Engineer
PMP-420: Preparation of ES&H Survey Form
RTS: Radon Treatment System
SOP 43-C-301: Water Treatment Plant Operation
WEMCO: Westinghouse Environmental Management Company of Ohio
WMCO: Westinghouse Materials Company of Ohio (Changed to WEMCO on 7/1/91)