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**Civilian Radioactive Waste Management System
Management and Operating Contractor**

Design Package 1D System Safety Analysis

Document No. BAB000000-01717-0200-00143 Revision 00

February 2, 1995

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Under Contract Number
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**Civilian Radioactive Waste Management System
Management and Operating Contractor**

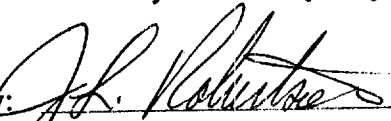
Design Package 1D System Safety Analysis

Revision 00

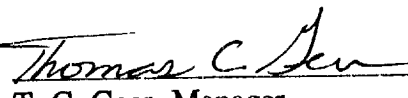
February 2, 1995

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Design Analysis Cover Sheet

Complete only applicable items.

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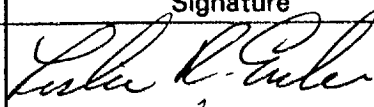


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WARNING

ALTHOUGH EVERY EFFORT HAS GENERALLY BEEN MADE TO INCORPORATE SAFETY FEATURES INTO DESIGN, IT IS OFTEN NECESSARY TO RELY ON PROCEDURES AND TRAINING TO MITIGATE SITUATIONS THAT CAN PRODUCE HAZARDS. SAFETY IS, THEREFORE, HEAVILY DEPENDENT ON ADEQUATE TRAINING AND PROCEDURES. INADEQUATE TRAINING OR PROCEDURES OR FAILURE TO STRICTLY ADHERE TO TRAINING AND PROCEDURES CAN LEAD TO SEVERE INJURIES OR DEATH.

1. PURPOSE

The purpose of this analysis is to systematically identify and evaluate hazards related to the Yucca Mountain Project Exploratory Studies Facility (ESF) Design Package 1D, Surface Facilities, (for a list of design items included in the package 1D system safety analysis see section 3). This process is an integral part of the systems engineering process; whereby safety is considered during planning, design, testing, and construction. A largely qualitative approach was used since a radiological System Safety Analysis is not required. The risk assessment in this analysis characterizes the accident scenarios associated with the Design Package 1D structures/systems/components in terms of relative risk and includes recommendations for mitigating all identified risks. The priority for recommending and implementing mitigation control features is: 1) Incorporate measures to reduce risks and hazards into the structure/system/component (S/S/C) design, 2) add safety devices and capabilities to the designs that reduce risk, 3) provide devices that detect and warn personnel of hazardous conditions, and 4) develop procedures and conduct training to increase worker awareness of potential hazards, on methods to reduce exposure to hazards, and on the actions required to avoid accidents or correct hazardous conditions.

The scope of this analysis is limited to the Design Package 1D structures/systems/components (S/S/Cs) during normal operations excluding hazards occurring during maintenance and "off normal" operations.

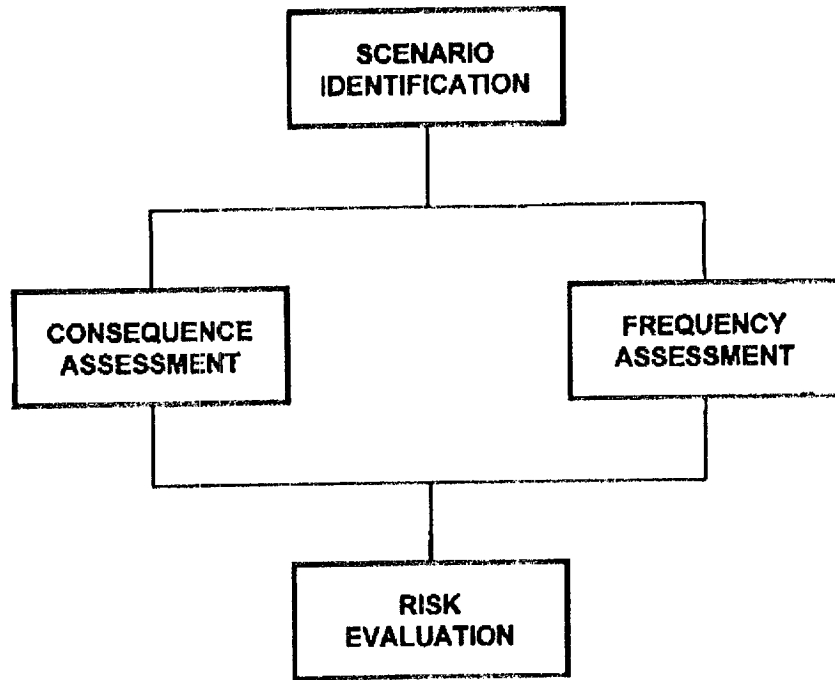
2. QUALITY ASSURANCE

A QAP-2-0 evaluation was performed to determine if the Design Package 1D System Safety Analysis is subject to QARD requirements. The results of the evaluation are presented in a "Quality Activity Evaluation Engineering Specialty", Revision 0, dated June 20, 1994.

Based on the results of the QAP-2-0 evaluation, this analysis is not considered to be important to radiological safety or waste isolation.

3. METHOD

The safety/risk assessment methodology used in this analysis is shown in Figure 1. The result of the analysis is a "risk evaluation" of the scenarios identified in this analysis in accordance with MIL-STD-882C. Three steps are required to complete the risk evaluation. The steps are hazard/scenario identification, consequence assessment, and frequency assessment. The word "accident" as used in this analysis refers to events, breakdowns, incidents, or any other occurrence that may have a negative effect on personnel safety.



PSARCH11.085/8-26-92

Figure 1. Risk Methodology Conceptual Overview

In addition to the guidance provided in DOE Orders, traditional methods of the System Safety Analysis were reviewed and adopted for this analysis, including those sources listed in sections 4 and 7.

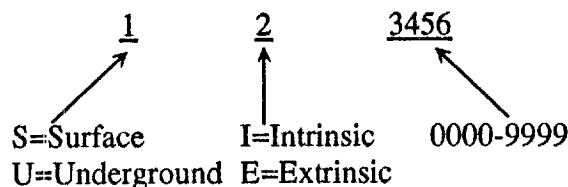
The S/S/C design items included in the ESF Design Package 1D safety analysis are:

- Muck Storage Area
- Conveyor Access Road

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- Piping (above ground)
 - Compressed Air
 - Diesel Fuel
 - Compressed Air Condensate Receiving System
- Equipment Pads and Foundations
- Site Lighting
- Pad Fencing
- Construction Equipment (e.g., trucks, bulldozers, graders)

The Design Package 1D System Safety Analysis consists of accidents caused by both intrinsic (e.g., human error, equipment failure) and extrinsic (e.g., act of nature, airplane crash) surface occurrences. Each of the scenarios is contained in Attachment A of this System Safety Analysis has a scenario number which uniquely identifies the scenario. The scenario number not only uniquely identifies the scenario, it also provides information concerning the type of scenario, i.e., surface or subsurface, extrinsic or intrinsic. The format of the scenario number is:



where 1 = S or U and 2 = I or E.

3.1 Scenario Identification

The first step involves the identification of possible accident scenarios that can have negative consequences for the ESF personnel or facilities. It is important to provide assurance that potentially significant scenarios have been considered and the consequences are appropriately mitigated through design selection, safety design features or devices, detection and warning devices, and/or use of procedures and training. To identify the scenarios, the Design Package 1D documentation was reviewed, i.e., design specifications, drawings, Determination of Importance Evaluations and the BFD.

A systematic procedure has been used to identify the relevant scenarios. The identification of scenarios is a relatively complex task. Analogous scenarios were grouped together to determine if there were any significant differences among them. For example, a group of accident scenarios addresses rupture of the diesel fuel tank and/or lines. The tank and/or lines rupture may be caused by an act of nature (e.g., earthquake, winds), a component failure (e.g., tank leak, defective valve), or human error (e.g., puncturing the tank, opening/closing the a valve at the

wrong time). Each of these scenarios could be included in the System Safety Analysis as a separate scenario, a subset of the group of scenarios could be included in the analysis, or a single representative sample scenario could be included in the System Safety Analysis. The decision of whether to include one or more scenarios from a group of potential scenarios in the System Safety Analysis was based on largely qualitative factors such as the probability that the scenarios will result in a significantly different risk designation, the accident can be associated with a particular situation or piece of equipment, and the probability that the accident cause(s) or result(s) will impact the frequency or consequence rating.

The scenarios are contained in Attachment A. Refer to the "System Safety Analysis Handbook," Scenario Analysis, page 3-241, for a description of scenario analysis.

3.2 Frequency Assessment

Bounding frequency estimates were developed for the accident scenarios and system failures. The frequency rating scale contains five levels of estimated frequency. The frequency levels are shown in Table 1.

Table 1. Frequency Rating Scale

Frequency		Description
A	Frequent	Likely to occur frequently
B	Probable	Will occur several times in the life of an SSC*
C	Occasional	Likely to occur some time in the life of an SSC*
D	Remote	Unlikely but possible to occur in the life of an SSC*
E	Improbable	So unlikely, it can be assumed occurrence may not be experienced

* SSC = system/structure/component (e.g., Design Package 1B, Design Package 2C)

On September 6-8, 1994, a System Safety Working Group met to review the TBM System Safety Analysis and the Design Package 2C System Safety Analysis. During this review the working group also defined a set of frequency and consequence scales. A major objective was to define

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the scales so that they could be applied to other system safety analyses with little or no modifications. Also during the review, DOE stated that the following new project phases and schedule were being established:

- Technical Site Suitability
- Environmental Impact Statement
- License Application.

DOE further said that the Technical Site Suitability phase is synonymous with the ESF; and they directed us to use a life expectancy of four (4) years for the Design Package 2C System Safety Analysis.

Based on the System Safety Working Group definitions and the life expectancy of the ESF, the frequency rating scale definitions used for this analysis are the same as the frequency rating scale definitions used for the TBM and Design Package 2C system safety analyses. The definitions are:

- Frequent - Greater than 4.5 occurrences during the life of Design Package 1D or more than one occurrence per year.
- Probable - Greater than 2.25 but not more than 4.5 occurrences during the life of Design Package 1D or one or less occurrence per year.
- Occasional - Greater than 1.0 but not more than 2.25 occurrences during the life of Design Package 1D or one or two occurrences during the life of Design Package 1D.
- Remote - Greater than .25 but not more than 1.0 occurrences during the life of Design Package 1D or the occurrence may happen once.
- Improbable - From 0 to .25 occurrences during the life of Design Package 1D or very unlikely, probably no occurrence.

3.3 Consequence Assessment

The potential range of consequences, from minor health effects to injury and/or fatality, was determined by using a consequence rating scale. The rating scale and definitions are presented in Table 2. The consequence rating scale also addresses potential impacts to site characterization data ranging from no loss of data to an irretrievable loss of license application data. The determination of consequence for each scenario, like the frequency estimate, was based on engineering experience and judgment and historical operating data.

Table 2. Consequence Rating and Definition

Consequence Level		Maximum Consequence
I	Catastrophic	Death, system/equipment loss, or severe environmental impact
II	Critical	Severe injury or illness, major system/equipment or environmental damage
III	Marginal	Minor injury or illness, minor system/equipment damage, minor delay of data collection or loss of data
IV	Negligible	Less than minor injury, occupational illness, or system damage

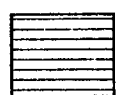
The definitions for the consequence ratings are the same as the definitions established by the System Safety Working Group for the TBM and Design Package 2C system safety analyses. They are:

- Catastrophic - Death
- Critical - Permanent partial or complete disability. Injury does not allow worker to return to same job (e.g., loss of limb or eye).
- Marginal - Nonpermanent, recoverable injury that would not preclude performing the same job (e.g., broken bones).
- Negligible - First aid injury with no loss of work time.

3.4 Risk Assessment

Risk is a function of frequency and consequence. The level of risk is determined by assigning a qualitative rating - high, medium, low, extremely low - to each of the frequency and consequence combinations. By determining each scenario's frequency of occurrence and level of consequence, the scenario's risk classification is determined by using the risk matrix in Figure 2. Within each risk category there is a precedence, based on consequence and frequency. For

FREQUENCY LEVELS	A	1	4	6	14
	B	2	5	10	15
	C	3	8	11	18
	D	7	9	16	19
	E	12	13	17	20
		I	II	III	IV
		CONSEQUENCE LEVELS			



High*



Low*



Medium*



Extremely Low*

* DOE is responsible for defining the criteria for risk acceptability
Figure 2. Risk Rating Matrix

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example, a scenario with a frequency = A and a consequence = I has a higher risk than a scenario with a frequency = A and a consequence = II.

Since the levels of risk are largely subjective, the risk designations must be viewed as relative. Relative risks are useful for determining the order in which risks are addressed; they are not absolute measures. Absolute risk is used when sufficient historical operating data is available on the same design as is currently being utilized and under the same operating conditions.

None-the-less, relative risk can be used as a management tool, especially when mitigation features have not been established and/or verified.

3.5 Exclusions

The following systems, structures, and components; processes; activities; and functions were not considered in this analysis:

- Conduits and piping (except for above ground piping directly associated with the condensate receiving tank and the diesel fuel storage tank);
- Pipe hangers and supports;
- Equipment mounting and anchors;
- Lamps and lights;
- Surface lightning protection system;
- Compressed air system (except for the condensate receiving tank);
- Maintenance procedures;
- Industrial hygiene exposure; and
- Emergency response/contingencies and off-normal operations.

In addition, this system safety analysis does not include determining hazards associated with construction, maintenance, maintenance facilities, training, testing, and support operations.

4. CODES AND STANDARDS

- 4.1 MIL-STD-882C; "System Safety Program Requirements," 19 January 1993
- 4.2 DOE Order 5481.1B; "Safety Analysis and Review System," 23 September 1986
- 4.3 SYSTEM SAFETY HANDBOOK-A source book for safety practitioners, July 1993, published by the System Safety Society.

5. CRITERIA

5.1 ESFDR, 3.2.1.19 Rev. 0, 7-14-94

6. ASSUMPTIONS

- The DOE CMO is responsible for determining whether the identified hazards associated with Design Package 1D have been adequately mitigated to proceed with construction and operations of the S/S/Cs.
- It is the designer's, i.e., M&O's, responsibility to implement the design based mitigation features, and it is the constructor's and operator's responsibility to verify and document that the hazards identified in this report have been mitigated.
- The information, i.e., Analysis and Conclusions, contained in this System Safety Analysis are limited to only the scenarios identified.
- Future design changes will need to be evaluated for risk to personnel.
- It is the constructor's and operator's responsibility to ensure that all procedures, training, manuals, and other documentation identified as mitigation features are complete, comprehensive, and accurate.
- The information contained in this System Safety Analysis covers the configuration items associated with Design Package 1D, excluding the tunnel conveyor system. An additional analysis will be required to identify hazards, safety features, and risks associated with the tunnel conveyor system.

7. REFERENCES

- 7.1 BAB000000-01717-6300-01014 REV 0B, "Summary of Work Package 1D, Specification Section 01014"
- 7.2 DOE Order 6430.1A, "General Design Criteria," 6 April 1989
- 7.3 Minutes of the Design Package 2C System Safety Analysis Review, 8 September 1994
- 7.4 YMP/CM-0019, "Exploratory Studies Facility Design Requirements," 15 July 1994
- 7.5 YMP/91-37, "Preliminary Safety Analysis Report for the Yucca Mountain Project Exploratory Studies Facility and Site Characterization Program"

8. COMPUTER PROGRAMS

Computer programs were not used in conjunction with this analysis.

9. RESULTS

Based on the results of the analysis, existing Preliminary Safety Analysis Report scenarios were modified and the need for new scenarios was identified. Table 3 identifies the scenarios contained in Attachment A. Each scenario was assigned to a risk category based on the consequence and the frequency of occurrence, and the scenario identification number was plotted on the risk rating matrix shown in Figure 3. Table 4 lists the scenarios in rank order from high to low risk levels.

Detailed scenario descriptions for the Design Package 1D S/S/Cs are contained in Attachment A.

Based on the frequency and consequence ratings, there were no scenarios with a high or medium risk designation, eight (8) scenarios with a low risk designation, and six (6) scenarios with an extremely low risk designation.

10. CONCLUSIONS

The Design Package 1D System Safety Analysis has identified hazards related to the design of the ESF Design Package 1D; the consequences of the hazards have been analyzed; an assessment of the risk(s) has been performed; and mitigation measures to eliminate or control hazards by design or operational controls have been identified. Information concerning the design was obtained from the Design Package 1D 90% review documentation.

Table 3. List of Scenarios Evaluated (page 1 of 2)

Scenario ID Number	Description
SE0102	Diesel fuel storage tank/lines leak/rupture due to earthquake or high winds
SE0103	Compressed air system condensate receiving tank/lines leak/rupture due to earthquake or high winds
SI0077	Diesel fuel storage tank leak/rupture causing extreme fire hazard, loss of life, delay in mining, loss of data
SI0110	Compressed air system condensate receiving tank leak/rupture causing loss of life, delay in mining, loss of data
SI0111	Personnel injury/fatality due to fall while climbing stairs/walking on platform on outside of diesel fuel storage tank
SI0112	Personnel injury/fatality due to fall while climbing up/down the outside of the compressed air system condensate receiving tank
SI0113	Personnel injury/fatality while climbing through manhole, looking through open manhole, or reaching through manhole (e.g., being struck on head, neck, back , or arm by cover) on condensate receiving tank or diesel fuel storage tank
SI0114	Personnel injury while opening/closing manhole access cover, while climbing through manhole, reaching through manhole, or climbing into/out (e.g., cutting hand, arm, leg) of condensate receiving tank or diesel fuel storage tank
SI0115	Rupture of diesel fuel piping
SI0116	Rupture of compressed air drain piping
SI0117	Personnel injury/equipment damage due to vehicle accident on conveyor access road

Table 3. List of Scenarios Evaluated (page 2 of 2)

Scenario ID Number	Description
SI0118	Personnel fatality and/or equipment damage due to vehicle accident on conveyor access road
SI0119	Personnel injury/fatality due to being struck by muck coming off conveyor into the muck storage area
SI0120	Personnel injury/fatality due to being struck by muck moving equipment/muck being moved by muck moving equipment in the muck storage area

FREQUENCY LEVELS	A				
	B				
	C				
	D		SI0115 SI0116 SI0117		
	E	SI0077 SI0110 SI0111 SI0112 SI0113 SI0118 SI0119 SI0120		SI0114	SE0102 SE0103
		I	II	III	IV
		CONSEQUENCE LEVELS			

Figure 3. Scenarios Distributed Over Risk Matrix

Table 4. Highest Risk Contributors (page 1 of 2)

Risk Level	Frequency Consequence	Scenario ID Number	Scenario Description
Low	E,I	SI0077	Diesel fuel storage tank leak/rupture causing extreme fire hazard, loss of life, delay in mining, loss of data
Low	E,I	SI0110	Compressed air system condensate receiving tank leak/rupture causing loss of life, delay in mining, loss of data
Low	E,I	SI0111	Personnel injury/fatality due to fall while climbing stairs/walking on platform on outside of diesel fuel storage tank
Low	E,I	SI0112	Personnel injury/fatality due to fall while climbing up/down the outside of the compressed air system condensate receiving tank
Low	E,I	SI0113	Personnel injury/fatality while climbing through manhole, looking through open manhole, or reaching through manhole (e.g., being struck on head, neck, back , or arm by cover) on condensate receiving tank or diesel fuel storage tank
Low	E,I	SI0118	Personnel fatality and/or equipment damage due to vehicle accident on conveyor access road
Low	E,I	SI0119	Personnel injury/fatality due to being struck by muck coming off conveyor into the muck storage area
Low	E,I	SI0120	Personnel injury/fatality due to being struck by muck moving equipment/muck being moved by muck moving equipment in the muck storage area

Table 4. Highest Risk Contributors (page 2 of 2)

Risk Level	Frequency Consequence	Scenario ID Number	Scenario Description
Extremely Low	D,III	SI0115	Rupture of diesel fuel piping
Extremely Low	D,III	SI0116	Rupture of compressed air drain piping
Extremely Low	D,III	SI0117	Personnel injury/equipment damage due to vehicle accident on conveyor access road
Extremely Low	D,III	SI0114	Personnel injury while opening/closing manhole access cover, while climbing through manhole, reaching through manhole, or climbing into/out (e.g., cutting hand, arm, leg) of condensate receiving tank or diesel fuel storage tank
Extremely Low	E,IV	SE0102	Diesel fuel storage tank/lines leak/rupture due to earthquake or high winds
Extremely Low	E,IV	SE0103	Compressed air system condensate receiving tank/lines leak/rupture due to earthquake or high winds

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Attachment A

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SE0102 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Diesel fuel storage tank/lines leak/rupture due to earthquake or high winds.

SYSTEM/COMPONENT FAILURE:

- Tank leak or rupture
- Piping system leak or rupture

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: IV - Negligible

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Tank is doubled walled.
- Diesel fuel oil system designed to withstand UBC Zone 3 seismic requirements.
- Diesel fuel oil system designed to withstand 80 mile per hour winds.
- Tank is securely bolted to pad.
- Establish regular inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Provide safety training (e.g., system/component isolation training).

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SCENARIO NUMBER: SE0102

MITIGATION DOCUMENTATION:

- 30 CFR 57, Subpart C
- National Fire Protection Association NFPA 30-93
- Underwriters laboratory, Inc. UL 142-93
- Uniform Building Code UBC-91
- Uniform Fire Code UFC-91
- System Specifications*
 - Specification Section 15482, Diesel Fuel Oil System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29033, Mechanical Diesel Fuel System Sections
- General Safety Manuals and Training*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SE0103 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Compressed air system condensate receiving tank/lines leak/rupture due to earthquake or high winds. (Rupture can be caused if the tank is not designed to withstand a predetermined seismic or wind load conditions or when conditions exceed the design limits of the tank. If any of the situations occur it is possible that the tank will fall off its supports and produce a rupture at the seams. Per discussion with R. Flye, 1/4/95.)

SYSTEM/COMPONENT FAILURE:

- Tank leak or rupture
- Piping system leak or rupture

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: IV - Negligible

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Tank is doubled walled.
- Condensate receiving system designed to withstand UBC Zone 3 seismic requirements.
- Condensate receiving system designed to withstand 80 mile per hour winds.
- Provide fire suppression system/equipment (e.g., fire hydrants, fire extinguishers).

(NOTE: Per discussion with R. Flye, 1/4/95, the condensate is made up of both oil and water. Oil composes approximately 2% of the condensate which will float on the surface of the condensate. Thus, there is the remote possibility of a fire, and the requirement for a fire suppression system/equipment and compliance with NFPA codes are appropriate.)

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SCENARIO NUMBER: SE0103

- Tank is securely bolted to pad.
- Establish regular inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Provide safety training (e.g., system/component isolation training).

MITIGATION DOCUMENTATION:

- 30 CFR 57, Subpart C
- Uniform Building Code UBC-91
- Uniform Fire Code UFC-91
- System Specifications*
 - Specification Section 15175, Condensate Receiving System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDF000-01717-2100-29044, Mechanical CAS Cnds. Drain System Condensate Tank Details
 - BABBDF000-01717-2100-29041, Mechanical CAS Cnds. Drain System, P&ID Sheet 1
 - BABBDF000-01717-2100-29042, Mechanical CAS Cnds. Drain System, P&ID Sheet 2
 - BABBDF000-01717-2100-29043, Mechanical CAS Cnds. Drain System, P&ID Sheet 3
- Safety Manuals*
- Maintenance Manuals*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0077 REVISION: 01 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Diesel fuel storage tank leak/rupture causing extreme fire hazard, loss of life, delay in mining, loss of data.

SYSTEM/COMPONENT FAILURE:

- Leak or rupture in above ground tank
- Human error (e.g., puncturing tank with piece of equipment)
- Failure to adhere to safety procedures and rules (e.g., driving vehicle in unauthorized area)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Tank is doubled walled.
- Leak detection is provided between the tank walls.
- Provide leak detection in tank annulus.
- Provide fire suppression system/equipment (e.g., fire hydrants, fire extinguishers).
- Establish regular inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, system/component isolation training).

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SCENARIO NUMBER: SI0077

MITIGATION DOCUMENTATION:

- 30 CFR 57, Subpart C
- Uniform Building Code UBC-91
- Uniform Fire Code UFC-91
- NFPA 30
- Resource Conservation and Recovery Act (RCRA)
- System Specifications*
 - Specification Section 15060, Mechanical Piping
 - Specification Section 15482, Diesel Fuel Oil System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29033, Mechanical Diesel Fuel System Sections
 - BABBDA000-01717-2100-29035, Mechanical Diesel Fuel System P&ID Sheet 1
 - BABBDA000-01717-2100-29036, Mechanical Diesel Fuel System P&ID Sheet 2
- Safety Manuals*
- Maintenance Manuals*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0110 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Compressed air system condensate receiving tank leak/rupture causing loss of life, delay in mining, loss of data.

SYSTEM/COMPONENT FAILURE:

- Leak or rupture in above ground tank
- Human error (e.g., puncturing tank with piece of equipment)
- Failure to adhere to safety procedures and rules (e.g., driving vehicle in unauthorized area)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Tank is doubled walled.
- Provide leak detection in tank annulus.
- Provide fire suppression system/equipment (e.g., fire hydrants, fire extinguishers).

(NOTE: Per discussion with R. Flye, 1/4/95, the condensate is made up of both oil and water. Oil composes approximately 2% of the condensate which will float on the surface of the condensate. Thus, there is the remote possibility of a fire, and the requirement for a fire suppression system/equipment and compliance with NFPA codes are appropriate.)

- Provide containment curb sufficient to hold minor leaks.

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- Establish regular inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, system/component isolation training).

MITIGATION DOCUMENTATION:

- 30 CFR 57, Subpart C
- Uniform Fire Code UFC-91
- NFPA 30-93
- Underwriters Laboratory, Inc. UL-142-93
- Resource Conservation and Recovery Act (RCRA)
- System Specifications*
 - Specification Section 15060, Mechanical Piping
 - Specification Section 15175, Condensate Receiving System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDF000-01717-2100-29044, Mechanical CAS Cnds. Drain System Condensate Tank Details
 - BABBDF000-01717-2100-29041, Mechanical CAS Cnds. Drain System, P&ID Sheet 1
 - BABBDF000-01717-2100-29042, Mechanical CAS Cnds. Drain System, P&ID Sheet 2
 - BABBDF000-01717-2100-29043, Mechanical CAS Cnds. Drain System, P&ID Sheet 3
- Safety Manuals*
- Maintenance Manuals*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0111 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Personnel injury/fatality due to fall while climbing stairs/walking on platform on outside of diesel fuel storage tank.

SYSTEM/COMPONENT FAILURE:

- Debris (e.g., oil, water, tools) on stairs or walkway
- Failure to adhere to safety procedures and rules
- Lack of non-skid surface on steps or walking surfaces
- Lack/failure of guard rails on walkway or stairs

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Provide adequate lighting in all areas.
- Provide guardrails/handrails and toe plates on all landings, platforms, and stairs.
- Provide non-skid surface on all landings, platforms, and steps.
- Post safety/warning signs.
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, personnel exclusion areas, how to obtain medical assistance).
- Require the use of safety belts/lines during work in unprotected areas.
- Establish inspection, cleanup, and maintenance procedures (inspect for debris and fluids, loose/missing guard rails, wear of non-skid surface, water on walking surfaces, etc.) and schedule. Maintain inspection, cleanup, and maintenance records.

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SCENARIO NUMBER: SI0111

MITIGATION DOCUMENTATION:

- 29 CFR 1910.23, .24
- 29 CFR 1926, Subparts C and E
- System Specifications*
 - Section 15482, Diesel Fuel Oil System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29033, Mechanical Diesel Fuel System Sections
- General Safety Manuals and Training*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0112 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Personnel injury/fatality due to fall while climbing up/down the outside of the compressed air system condensate receiving tank.

SYSTEM/COMPONENT FAILURE:

- Lack of ladder/handles
- Debris (e.g., oil, water, tools)
- Failure to adhere to safety procedures and rules

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Provide adequate lighting in all areas.
- Provide climbing aid(s) which give personnel access to the top of the tank (e.g., portable ladder with handrails/handles, non-slip footholds and handholds, rigid enough to maintain a safe climbing angle, and securable to the outside of the tank).
- Provide non-skid surface on steps/rungs.
- Post safety/warning signs.
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, personnel exclusion areas, how to obtain medical assistance).
- Require the use of fall protection (e.g., safety belts/lines), as appropriate.
- Establish inspection, cleanup, and maintenance procedures (inspect for debris and fluids, loose/missing guard rails, water on walking surfaces, etc.) and schedule. Maintain inspection, cleanup, and maintenance records.

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SCENARIO NUMBER: SI0112

MITIGATION DOCUMENTATION:

- 29 CFR 1910.27
- 29 CFR 1926, Subparts C and E
- System Specifications*
 - Section 15175, Condensate Receiving System*
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDF000-01717-2100-29044, Mechanical CAS Cnds. Drain System
Condensate Tank Details
 - BABBDF000-01717-2100-29041, Mechanical CAS Cnds. Drain System, P&ID
 - BABBDF000-01717-2100-29042, Mechanical CAS Cnds. Drain System, P&ID
 - BABBDF000-01717-2100-29043, Mechanical CAS Cnds. Drain System, P&ID
- Safety Manuals*
- Maintenance Manuals*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0113 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Personnel injury/fatality while climbing through manhole, looking through open manhole, or reaching through manhole (e.g., being struck on head, neck, back , or arm by cover) on condensate receiving tank or diesel fuel storage tank.

SYSTEM/COMPONENT FAILURE:

- Lack/ failure of self-supporting mechanism if the cover is self closing/bolt(s) if cover is removable
- Failure to adhere to safety procedures and rules (e.g., failure to secure cover in open position)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- There are two styles of covers available for the manholes on these tanks - self closing and removable (bolts are used to secure the cover in place). The covers selected for the tanks are removable. (Reference discussion with R. Flye, 1/4/95.) The normal method for opening removable covers is to remove all the bolts which are used to secure the cover except one, and rotate the cover out of the way using the one bolts as a pivot point. (Reference discussion with K. Frederick, 1/4/95.)

Develop procedure and provide training on proper cover removal and securing.

Provide mechanism/aid which prevents cover from accidentally closing, i.e., locks cover in the open position, when cover is open.

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SCENARIO NUMBER: SI0113

- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, personnel exclusion areas, how to obtain medical assistance).
- Require the use of safety belts/lines and a second person per MSHA 57.15005.
- Establish inspection, cleanup, and maintenance procedures (inspect for debris and fluids, loose/missing fasteners) and schedule. Maintain inspection, cleanup, and maintenance records.

MITIGATION DOCUMENTATION:

- 30 CFR 57.15005
- NFPA 30-93
- Underwriters Laboratory, Inc. UL-142-93
- System Specifications*
 - Specification Section 15175, Condensate Receiving System
 - Specification Section 15482, Diesel Fuel Oil System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDF000-01717-2100-29044, Mechanical CAS Cnds. Drain System Condensate Tank Details
 - BABBDA000-01717-2100-29033, Mechanical Diesel Fuel System Sections
- Safety Manuals*
- Maintenance Manuals*

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ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0114 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Personnel injury while opening/closing manhole access cover, while climbing through manhole, reaching through manhole, or climbing into/out (e.g., cutting hand, arm, leg) of condensate receiving tank or diesel fuel storage tank.

SYSTEM/COMPONENT FAILURE:

- Lack of grasp areas for opening/closing cover (e.g., handles, hinges)
- Lack of access/egress aids (e.g., internal ladder)
- Lack of rounding/protection on exposed edges and corners
- Failure to adhere to safety procedures and rules (e.g., failure to secure cover in open position)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: III - Marginal

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- There are two styles of covers available for the manholes on these tanks - self closing and removable (bolts are used to secure the cover in place). The covers selected for the tanks are removable. (Reference discussion with R. Flye, 1/4/95.) The normal method for opening removable covers is to remove all the bolts which are used to secure the cover except one, and rotate the cover out of the way using the one bolts as a pivot point. (Reference discussion with K. Frederick, 1/4/95.)

Develop procedure and provide training on proper cover removal and securing.

SCENARIO NUMBER: SI0114

Provide mechanism/aïd which prevents cover from accidentally closing, i.e., locks cover in the open position, when cover is open.

- Provide handles for opening/closing manhole covers..
- Round manhole covers and all other exposed edges and corners with which personnel may come in contact.
- Provide a portable ladder for accessing the inside of the tanks. The ladder shall be transportable by personnel climbing on the outside of the tanks, be securable to the outside of the tanks through the use of positive locking/latching or some other mechanism, have non-slip footholds and handholds, have a non-skid surface at the base of the ladder, and be rigid enough to maintain a safe climbing angle. (The recommendation to use a portable ladder is based on the fact that the tank designs do not include internal ladders because it is not anticipated that personnel will require frequent access to the inside of the tanks.)
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, personnel exclusion areas, how to obtain medical assistance, use of respirators).
- Establish inspection, cleanup, and maintenance procedures (inspect portable ladder, inspect for debris and fluids, loose/missing fasteners) and schedule. Maintain inspection, cleanup, and maintenance records.

MITIGATION DOCUMENTATION:

- 30 CFR 57.15005
- NFPA 30-93
- Underwriters Laboratory, Inc. UL-142-93
- System Specifications*
 - Specification Section 15175, Condensate Receiving System
 - Specification Section 15482, Diesel Fuel Oil System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDF000-01717-2100-29044, Mechanical CAS Cnds. Drain System
Condensate Tank Details
 - BABBDA000-01717-2100-29033, Mechanical Diesel Fuel System Sections

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SCENARIO NUMBER: SI0114

- Safety Manuals*
- Maintenance Manuals*

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ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0115 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Rupture of diesel fuel piping.

SYSTEM/COMPONENT FAILURE:

- Failure/rupture of pipe and/or pipe fittings
- Failure/leak of diesel fuel storage tank(s)
- Failure/malfunction of valve
- Human error (e.g., leaving valve open/closed, vehicle striking pipe)
- Failure of mechanical joint(s)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: D - Remote

Consequence Rating: III - Marginal

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Provide isolation valves for the diesel fuel oil system which close when flow meter senses a pipe rupture/failure.
- Locate isolation valves to minimize oil losses due to pipe rupture.
- Provide safety relief valves with the American Society of Mechanical Engineers (ASME) code stamped receivers to alleviate over pressure.
- Post safety/warning signs.
- Provide lockout/tagout for valves.
- Locate valves so that they are easily accessible and labels are visible.
- Label rotary control valves with direction of movement.
- Provide runoff/drainage channels/trenches for fuel to drain off the pad and into authorized containment area.

SCENARIO NUMBER: SI0115

- Spill containment is provided for the volume of oil contained in the pipes. While spill containment is a leak mitigation feature it also has a safety benefit by reducing the potential for personnel injury caused by the uncontrolled release of oil.
- Position piping away from conveyances.
- Establish inspection, maintenance, and test procedures (e.g., valves, pipes) and schedule. Maintain inspection, maintenance, and test records.
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, lockout/tagout).

MITIGATION DOCUMENTATION:

- 29 CFR 1910.147, 1926.200
- DOE 6430.1, General Design Criteria Manual
- Uniform Building Code UBC-91
- Resource Conservation and Recovery Act (RCRA)
- System Specifications*
 - Specification Section 15060, Mechanical Piping
 - Specification Section 15482, Diesel Fuel Oil System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDA000-01717-2100-29033, Mechanical Diesel Fuel System Sections
 - BABBDA000-01717-2100-29035, Mechanical Diesel Fuel System P&ID
 - BABBDA000-01717-2100-29036, Mechanical Diesel Fuel System P&ID
- Training Manuals*
- Maintenance Manuals*
- Safety Manuals*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0116 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

North Pad

SCENARIO:

Rupture of compressed air drain piping.

SYSTEM/COMPONENT FAILURE:

- Failure/rupture of pipe and/or pipe fittings
- Failure/leak of compressed air storage tank(s)
- Failure/malfunction of valve
- Human error (e.g., leaving valve open/closed, vehicle striking pipe)
- Failure of mechanical joint(s)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: D - Remote

Consequence Rating: III - Marginal

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Provide isolation valves which close when flow meter senses a pipe rupture/failure.
- Provide safety relief valves with the American Society of Mechanical Engineers (ASME) code stamped receivers to alleviate over pressure.
- Post safety/warning signs.
- Provide lockout/tagout for valves.
- Locate valves so that they are easily accessible and labels are visible.
- Label rotary control valves with direction of movement.
- Provide temperature and pressure gauges which clearly identify in tolerance, out of tolerance, and warning conditions.

SCENARIO NUMBER: SI0116

- Provide runoff/drainage channels/trenches for condensate to drain off the pad and into authorized containment area.
- Spill containment is provided for the volume of condensate contained in the pipes. While spill containment is a leak mitigation feature it also has a safety benefit by reducing the potential for personnel injury caused by the uncontrolled release of condensate.
- Position piping away from conveyances.
- Establish inspection, maintenance, and test procedures (e.g., valves, pipes) and schedule. Maintain inspection, maintenance, and test records.
- Provide safety training (e.g., rules and regulations concerning the employee's safety and the safety of others, lockout/tagout).

MITIGATION DOCUMENTATION:

- 29 CFR 1910.147, 1926.200
- DOE 6430.1, General Design Criteria Manual
- Uniform Building Code UBC-91
- Resource Conservation and Recovery Act (RCRA)
- System Specification Sections*
 - Specification Section 15060, Mechanical Piping
 - Specification Section 15175, Condensate Receiving System
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABBDF000-01717-2100-29022, Mechanical Compressed Air System Enlarged Pad Plan
 - BABBDF000-01717-2100-29023, Mechanical Compressed Air System Elevations Sect & Details
 - BABBDF000-01717-2100-29041, Mechanical CAS Cnds. Drain System, P&ID
 - BABBDF000-01717-2100-29042, Mechanical CAS Cnds. Drain System, P&ID
 - BABBDF000-01717-2100-29043, Mechanical CAS Cnds. Drain System, P&ID

SCENARIO NUMBER: SI0116

- Training Manuals*
- Maintenance Manuals*
- Safety Manuals*

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ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0117 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

Conveyor Access Road

SCENARIO:

Personnel injury/equipment damage due to vehicle accident on conveyor access road.

SYSTEM/COMPONENT FAILURE:

- Road Hazards (e.g., pot holes, sharp curves, lane width, excess water)
- Vehicle malfunction (e.g., brake failure, tire failure)
- Human error (e.g., speeding)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: D - Remote

Consequence Rating: III - Marginal

Risk Designation: Extremely Low

MITIGATION/CONTROL FEATURES:

- Design road to handle maximum expected vehicle size and weight and traffic pattern(s).
- Limit travel on road to authorized maintenance vehicles.
- Provide vehicles with "back-up" alarms per OSHA requirements.
- Equip vehicles with personnel restraints per OSHA requirements.
- Provide vehicles with rollover protection per OSHA requirements.
- Provide vehicle cabs with protection in the event that the light pole falls on the vehicle, per OSHA requirements.
- Locate light standard foundations to reduce likelihood of striking.
- Design foundations to withstand greatest expected impact (must consider vehicle size and travel speed).
- Provide "break away" light standard foundation/poles.

SCENARIO NUMBER: SI0117

- Provide headlights on vehicles.
- Post safety/warning signs (e.g., speed limits, dangerous curve).
- Establish inspection and maintenance procedures and schedule. Maintain inspection and maintenance records.
- Provide safety training (e.g., speed limits, how to obtain medical assistance).
- Require all personnel operating vehicles to be licensed.

MITIGATION DOCUMENTATION:

- Current drivers license or commercial drivers license, as appropriate
- System Specifications*
 - Section 02211, Site Grading-Muck Storage Area and Conveyor Access Road
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABA00000-01717-2100-20068, Muck Storage Access Road Profile
 - BABA00000-01717-2100-20069, Muck Storage Access Road Profile
 - BABA00000-01717-2100-20070, Muck Storage Access Road Profile
 - BABA00000-01717-2100-20011, Typical Road Section
 - BABBDA000-01717-2100-23016, Structural Site
- Vehicle Specifications*
- 29 CFR 1910.145
- DOE 6430.1, General Design Criteria Manual
- 30 CFR 57, Subpart H
- Training Manuals*
- Operators Manuals*
- Maintenance Manuals*
- General Safety Manuals and Training*

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ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0118 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

Conveyor Access Road

SCENARIO:

Personnel fatality and/or equipment damage due to vehicle accident on conveyor access road.

SYSTEM/COMPONENT FAILURE:

- Road Hazards (e.g., pot holes, sharp curves, lane width, excess water)
- Vehicle malfunction (e.g., brake failure, tire failure)
- Human error (e.g., speeding)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Design road to handle maximum expected vehicle size and traffic pattern(s).
- Provide vehicles with "back-up" alarms per OSHA requirements.
- Equip vehicles with personnel restraints per OSHA requirements.
- Provide vehicles with rollover protection per OSHA requirements.
- Provide vehicle cabs with protection in the event that the light pole falls on the vehicle, per OSHA requirements.
- Locate light standard foundations to reduce likelihood of striking.
- Design foundations to withstand greatest expected impact (must consider vehicle size and travel speed).
- Provide "break away" light standard foundation/poles.
- Provide headlights on vehicles.

SCENARIO NUMBER: SI0118

- Post safety/warning signs (e.g., speed limits, dangerous curve).
- Establish inspection and maintenance procedures and schedule for access road and vehicles. Maintain inspection and maintenance records.
- Provide safety training (e.g., speed limits, how to obtain medical assistance).
- Require all personnel operating vehicles to be licensed.

MITIGATION DOCUMENTATION:

- Current drivers license or commercial drivers license, as appropriate
- System Specifications*
 - Section,02211, Site Grading-Muck Storage Area and Conveyor Access Road
 - Specification Section 01800, Maintenance and Operation of Surface Facilities
- Title II Design Drawings*
 - BABA00000-01717-2100-20068, Muck Storage Access Road Profile
 - BABA00000-01717-2100-20069, Muck Storage Access Road Profile
 - BABA00000-01717-2100-20070, Muck Storage Access Road Profile
 - BABA00000-01717-2100-20011, Typical Road Section
 - BABBDA000-01717-2100-23016, Structural Site
- Vehicle Specifications*
- 29 CFR 1910.145
- DOE 6430.1, General Design Criteria Manual
- 30 CFR 57, Subpart H
- Training Manuals*
- Operators Manuals*
- Maintenance Manuals*
- General Safety Manuals and Training*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0119 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

Muck Storage Area

SCENARIO:

Personnel injury/fatality due to being struck by muck coming off conveyor into the muck storage area.

SYSTEM/COMPONENT FAILURE:

- Failure to adhere to safety procedures and rules (e.g., not wearing hard hat and eye protection, personnel under conveyor when conveyor is operating)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Provide emergency stop so that conveyor can be shut off in the event of an emergency.
- Provide audio/visual alarm that activates before the conveyor starts.
- Provide adequate lighting so that personnel in the area can be observed.
- Post safety/warning signs (e.g., Danger Area - Do Not Enter).
- Provide safety training (e.g., lockout/tagout the control panel before personnel are allowed to work on the conveyor).

SCENARIO NUMBER: SI0119

MITIGATION DOCUMENTATION:

- System Specification Section,02211, Site Grading-Muck Storage Area and Conveyor Access Road*
- Title II Design Drawings*
 - BABCC0000-01717-2100-20074, Muck Storage Area Site Grading Plan and Access Road
 - BABCC0000-01717-2100-20075, Muck Storage Area Site Grading Plan and Access Road
- 30 CFR 57, Subpart H
- General Safety Manuals and Training*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.

ACCIDENT ANALYSIS SUMMARY

SCENARIO NUMBER: SI0120 REVISION: 00 REVISION DATE: 10/15/94

LOCATION:

Muck Storage Area

SCENARIO:

Personnel injury/fatality due to being struck by muck moving equipment/muck being moved by muck moving equipment in the muck storage area.

SYSTEM/COMPONENT FAILURE:

- Failure to adhere to safety procedures and rules (e.g., personnel in unauthorized area, not inspecting area before moving muck)

ACCIDENT CLASSIFICATION AFTER MITIGATION:

Frequency Rating: E - Improbable

Consequence Rating: I - Catastrophic

Risk Designation: Low

MITIGATION/CONTROL FEATURES:

- Provide adequate lighting so that personnel in the area can be observed.
- Post safety/warning signs (e.g., no entry, authorized personnel only).
- Provide safety training.

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SCENARIO NUMBER: SI0120

MITIGATION DOCUMENTATION:

- System Specification Section, 02211, Site Grading-Muck Storage Area and Conveyor Access Road*
- Title II Design Drawings*
 - BABCC0000-01717-2100-20074, Muck Storage Area Site Grading Plan and Access Road
 - BABCC0000-01717-2100-20075, Muck Storage Area Site Grading Plan and Access Road
- 30 CFR 57, Subpart H
- General Safety Manuals and Training*

* It is the designer's and constructor's and operator's responsibility to assure that the hazard(s) associated with this scenario have been mitigated through proper documentation.