CRWMS/M&O

Design Analysis Cover Sheet

Complete only applicable items.

(1.)

WBS: 1.2.6
QA: QA
Page: 1 Of: 19

SCPB: N/A

2. DESIGN ANALYSIS TITLE
NORTH PORTAL FUEL STORAGE SYSTEM FIRE HAZARD ANALYSIS-ESF SURFACE DESIGN PACKAGE 1D

3. DOCUMENT IDENTIFIER	4. REV. NO.	5. TOTAL PAGES
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	Print Name	Signature	Date
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11. Department Manager	~~J. J. Salchak~~ G.N. KIMURA INITIAL & DATE GAP 1/27/95	G.N. Kimura	1-18-95

12. REMARKS

CRWMS/M&O

Design Analysis Revision Record

Complete only applicable items.

(1.)

WBS: 1.2.6
QA: QA

2. DESIGN ANALYSIS TITLE
NORTH PORTAL FUEL STORAGE SYSTEM FIRE HAZARD ANALYSIS-ESF SURFACE DESIGN PACKAGE 1D

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5. Revision No.	6. Pages Added	7. Pages Deleted	8. Description of Revision
00			Issue for Construction.

TABLE OF CONTENTS

1. PURPOSE

1.1 The purpose of the fire hazard analysis is to comprehensively assess the risk from fire within the individual fire areas. This document will only assess the fire hazard analysis within the Exploratory Studies Facility (ESF) Design Package 1D, which includes the fuel storage system area of the North Portal facility, and evaluate whether the following objectives are met:

1.1.1 This analysis, performed in accordance with the requirements of this document, will satisfy the requirements for a fire hazard analysis in accordance with U.S. Department of Energy (DOE) Order 5480.7A.

1.1.2 Ensure that property damage from fire and related perils does not exceed an acceptable level.

1.1.3 Provide input to the ESF Basis For Design (BFD) Document.

1.1.4 Provide input to the facility Safety Analysis Report (SAR) (Paragraph 3.8).

2. QUALITY ASSURANCE

2.1 Work performed by this analysis shall be quality assurance classified as: NONE.

2.2 The fuel storage system is considered as a temporary utility. There are no Determination of Importance Evaluation (DIE) controls affected by this analysis.

2.3 The fire hazard analysis shall be maintained as a lifetime record as part of the facility project files and shall be referenced in the facility SAR.

3. METHOD

As required by DOE Order 5480.7A, a fire hazard analysis includes a detailed narrative description and fire safety review of the facility, its location, fire areas, processes, occupancy, construction, fire and life safety features and hazards. This fire hazard analysis is performed under the direction of a qualified fire protection engineer. The following sections detail the steps necessary to perform this analysis.

3.1 FACILITY DESCRIPTION, PROCESSES, AND CLASSIFICATION

3.1.1 Provide a general description and location.

3.1.2 Provide a short narrative description of the facility, including its location within the site area and its intended use and occupancy.

3.1.3 Provide a detailed summary of the operations, processes, and activities that take place within the facility or are planned for new facilities. Provide product and process information concerning the raw materials, products, waste streams, production sequence, essential safety related equipment, and other information required to assess the fire and life safety risks within the facility or individual fire areas.

3.2 FIRE AREA DESCRIPTIONS AND FEATURES

3.2.1 Provide a detailed description of the facility by fire area, including information on the following:

- Fire protection features
- Description of fire hazards
- Life safety considerations
- Damage potential according to Maximum Credible Fire Loss (MCFL) and Maximum Possible Fire Loss (MPFL)
- Fire Department/Reynolds Electrical & Engineering Co., Inc. (REECo) Fire Protection Services response
- Potential for a toxic, biological and/or radiation incident due to a fire
- Emergency planning
- Impact of natural hazards (earthquake, flood, wind) on fire safety
- Exposure fire potential, including the potential for fire spread between fire areas.

3.2.2 Fire area boundaries and physical separation shall be analyzed based on the requirements of the applicable building codes [Uniform Building Code (UBC), Uniform Fire Code (UFC), DOE Order 6430.1A], the monetary values and limits set for DOE orders, national codes and standards (NFPA, Factory Mutual, etc.), and hazard inventory in each fire area.

3.2.3 The hazard inventories shall identify the combustibles in each fire area.

3.3 SPECIAL CONSIDERATIONS

3.3.1 Assess the potential impact on fire safety from natural hazards such as earthquake, flood, lightning, windstorm, etc.

3.3.2 Provide a description of the REECo Fire Protection Services response to a fire incident, including anticipated response times, apparatus available to respond, appliances and equipment condition and availability, accessibility of the facility or fire areas, water supply available for fire fighting operations, fire pre-plan adequacy, and emergency planning (including non-fire events). Response time shall be the total of the following events: alarm receipt, turn out time, travel time, and fire scene set up.

3.3.3 Identify, describe, and assess the administrative controls in place or anticipated for the facility. Include compensatory measures when fire protection systems are out of service, control of combustibles, technical fire specifications, smoking controls, welding and cutting controls, surveillance and maintenance procedures, personnel fire training, and any other programs or systems in place.

3.4 FIRE EFFECTS AND DAMAGE POTENTIAL

Fire effects and damage potential scenarios and costs must be reviewed with the facility personnel prior to being finalized to ensure that the scenario and loss figures are reasonable and justified.

3.5 MAXIMUM POSSIBLE FIRE LOSS (MPFL)

The MPFL is the single worst case fire scenario for a facility, with no mitigating actions to suppress the fire. The MPFL will be the highest value fire area in the facility, including building, contents, equipment, decontamination and cleanup, and consequent effects of fire fighting.

3.5.1 Describe the fire scenario, the fire area involved, and any exposures or consequent effects anticipated in adjacent fire areas.

3.5.2 Provide the fire loss amount for building, contents, and equipment. Provide an estimated cost, with appropriate details and assumptions, for the fire fighting, decontamination and cleanup, and any ancillary costs (inflation, engineering design, overheads, etc.).

3.5.3 Describe the programmatic consequences that would result from the MPFL fire scenario. Provide recovery potential details including temporary power, interim production, and other measures that could be implemented to improve damage recovery.

3.5.4 Compare the MPFL costs and consequences to the criteria in DOE Orders 5480.7 and 6430.1A, Section 1530-2.3, and determine into which category the MPFL fits. From this analysis, determine the level of protection required and determine if it is achieved. Make any required recommendations in the Conclusions section for additional measures to achieve the necessary protection.

3.6 MAXIMUM CREDIBLE FIRE LOSS (MCFL)

The MCFL is the fire scenario that would cause the largest single fire loss able to be controlled by the installed automatic fire protection systems. The MCFL can be assumed to be the single highest cost piece of equipment or process in the facility (from MCFL) that will burn. The installed automatic fire protection systems are assumed to control the fire and limit damage to the involved piece of equipment.

3.6.1 Describe the fire scenario, the equipment and fire area involved, and any exposures or consequent effects to adjacent equipment or contents of the fire area.

3.6.2 Provide the fire loss amount for building, contents, and equipment. Provide an estimated cost, with appropriate details and assumptions, for fire fighting, decontamination and cleanup, and any ancillary costs (inflation, engineering design, overheads, etc.).

3.6.3 Describe the programmatic consequences that would result from the MCFL fire scenario. Provide recovery potential details including temporary power, interim production, spare equipment, and replacement times, if available.

3.6.4 Analyze the fire scenario and its consequences and determine if the MCFL is acceptable to DOE objectives and the facility or process involved. Make the necessary recommendations for additional protection to achieve any required improvements to reduce or mitigate the consequences of the MCFL.

3.7 MOST PROBABLE FIRE (MPF) SCENARIO

The MPF is the single most likely significant fire scenario that can be anticipated to occur in the facility. The MPF is not the insignificant "trash can" fire. The MPF scenario must be developed using sound professional judgment, including fire loss historical data, possible ignition sources, type of occupancy, potential fire growth and development, and anticipated automatic suppression effects.

3.7.1 Describe the MPF scenario, including the basis for its selection. Include potential risk, ignition method, and suppression results.

3.7.2 Describe anticipated fire loss and consequences of the fire. Include normal cleanup and fire fighting costs, decontamination if required, and any anticipated ancillary costs.

3.7.3 Develop and describe the anticipated risk of the MPF occurring, and provide data for use in the facility SAR if required.

3.8 TERMS AND DEFINITIONS

Terms and definitions are established based upon the DOE orders, the UBC, and applicable national standards.

3.8.1 **Acceptable** - When applied to fire safety, "acceptable" is a level of protection which the Authority Having Jurisdiction (AHJ), after consultation with the cognizant DOE fire protection engineer(s), considers sufficient to achieve the objectives defined above. In some instances, it is a level of protection that deviates (plus or minus) from a code or standard as necessary and yet adequately protects against the inherent fire hazards.

3.8.2 **Authority Having Jurisdiction (AHJ)** - The decision-making authority in matters concerning fire protection. Except as directed by the Program Secretarial Officers, the Heads of Field Organizations or designee is the AHJ. Decisions impacting fire safety shall be made by the AHJ only after consultation with the cognizant DOE fire protection engineer(s). Where an Area Office or Site Office exists within the DOE organization, a formal, clearly defined delegation of fire protection responsibility shall be established regarding the AHJ.

3.8.3 **DOE Fire Protection Program** - Those fire protection requirements, hardware, administrative controls, procedures, guidelines, plans, personnel, analyses, and technical criteria that comprehensively ensure that DOE objectives relating to fire safety are achieved.

3.8.4 **Equivalency** - The approved alternate means of satisfying the technical provisions of a fire protection code or standard. (Deviations from specific requirements of occupational safety and health standards, as delineated in the Code of Federal Regulations (CFR), are treated as variances as defined in the DOE's Occupational Safety and Health Program.)

3.8.5 **Exemption** - The approved deviation from a non-statutory code, standard, or DOE order. (Deviations from specific requirements of occupational safety and health standards, as delineated in the CFR, are treated as variances as defined in the DOE's Occupational Safety and Health Program).

3.8.6 **Fire Area** - A location bounded by construction having a minimum fire resistance rating of two hours with openings protected by appropriate fire-rated doors, dampers, or penetration seals. The boundaries of exterior fire areas (yard areas) shall be as determined by the AHJ.

3.8.7 **Fire Loss** - The dollar cost of restoring damaged property to its pre-fire condition (refer to DOE Order 5484.1). In determining loss, the estimated damage to the facility and contents shall include replacement costs, less salvage value. Losses will exclude the cost of restoring:

- Property that is scheduled for demolition
- Property that is decommissioned and not carried on books as a value
- Property with no loss potential.

Include the cost of decontamination and cleanup, the loss of production or program continuity, the indirect costs of fire extinguishment (such as damaged fire department equipment), and consequent effects on related areas in all property loss amounts.

3.8.8 **Fire Protection** - A broad term which encompasses all aspects of fire safety, including:

- Building construction and fixed building fire features
- Fire suppression and detection systems
- Fire water systems
- Emergency process safety control systems
- Emergency fire fighting organizations (fire departments, fire brigades, etc.)
- Fire protection engineering
- Fire prevention.

Fire protection is concerned with preventing or minimizing the direct and indirect consequences of fire. It also includes aspects of the following perils as they relate to fire protection: explosion, natural phenomena, smoke and water damage from fire.

3.8.9 **Fire Protection System** - Any system designed to detect, extinguish, and limit the extent of fire damage or enhance life safety. Where redundant fire protection systems are required, any two of the following will satisfy that requirement:

- Automatic suppression systems, such as fire sprinklers, foam, gaseous, explosion suppression, or other specialized extinguishing systems, plus appropriate alarms. An adequate supply, storage, and distribution system is an essential element.

- Automatic fire detection, occupant warning, manual fire alarm, and fire alarm reporting systems combined with properly equipped and adequately trained fire departments.

- Fire barrier systems or combinations of physical separation and barriers for outdoor locations.

- Other systems, such as alternate process control systems, as approved by the AHJ.

3.8.10 **Maximum Credible Fire Loss (MCFL)** - The property damage that would be expected from a fire, assuming that all installed fire protection systems function as designed, and the effect of emergency response is omitted except for post-fire actions such as salvage work, shutting down water systems, and restoring operation.

3.8.11 Maximum Possible Fire Loss (MPFL) - The value of property (excluding land) within a fire area, unless a fire hazard analysis demonstrates a lesser (or greater) loss potential. This assumes the failure of both automatic fire suppression systems and manual fire fighting efforts.

3.8.12 Property - All government-owned or leased structures and contents for which DOE has responsibility, including:

- All DOE land, structures, and contents
- All leased locations
- All other Government property on DOE land or in DOE structures
- Other property that occupies DOE land or is in DOE structures.

3.8.13 Qualified Fire Protection Engineer - A graduate of an accredited engineering curriculum who has completed not less than four years of engineering practice, three of which shall have been in responsible charge of diverse fire protection engineering work. If not such a graduate, a qualified engineer shall either: demonstrate a knowledge of the principles of engineering and have completed not less than six years engineering practice, three of which shall have been in responsible charge of diverse fire protection engineering projects; be a registered professional engineer in fire protection; or meet the requirements for a Grade 11 or higher Fire Protection Engineer as defined by the U.S. Office of Personnel Management.

3.8.14 Related Perils - Aspects of the following as they relate to fire protection: explosion, natural phenomena, smoke, and water damage.

3.8.15 Risk - A term used to describe the overall potential for loss (refer to DOE Order 5481.1B).

3.8.16 Safety Class Equipment - Systems, structures, or components including primary environment monitors and portions of process systems, whose failure could adversely affect the environment or the safety and health of the public.

3.8.16.1 For nuclear reactors and non-reactor nuclear facilities, Class A Equipment includes those systems, structures, or components with the following characteristics:

- Those whose failure would produce exposure consequences that would exceed DOE established guidelines at the site boundary or nearest point of uncontrolled public access.

- Those required to maintain operating parameters within the safety limits specified in Technical Safety Requirements (Technical Specification or Operational Safety Requirements) during normal operations and anticipated operational occurrences.

- Those required for nuclear criticality safety.
- Those required to monitor the release of radioactive materials to the environment during and after a design basis accident.
- Those required to monitor and maintain the facility in a safe shutdown condition.
- Those that control the safety class items described above.

3.8.17 **Vital Program** - A DOE program so defined by the Program Secretarial Officers (PSOs).

4. CODES AND STANDARDS

4.1 U.S. DEPARTMENT OF ENERGY (DOE):

DOE Order 4700.1	Project Management System	1987 Edition
DOE Order 5480.4	Environmental Protection, Safety, and Health Protection Standards	1984 Edition
DOE Order 5480.5	Safety of Nuclear Facilities	1984 Edition
DOE Order 5480.7A	Fire Protection	1993 Edition
DOE Order 5484.1	Environmental Protection, Safety and Health Protection Information Reporting Requirements	1981 Edition
DOE Order 6430.1A	General Design Criteria	1989 Edition

4.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

NFPA 10	Portable Fire Extinguishers	1990 Edition
NFPA 24	Private Fire Service Mains and Their Appurtenances	1992 Edition
NFPA 30	Flammable and Combustible Liquids Code, 17th Edition	1993 Edition
NFPA 70	National Electrical Code	1993 Edition
NFPA 80A	Recommended Practice for Protection of Buildings from Exterior Fire Exposures	1989 Edition

NFPA 220	Standards on Types of Building Construction	1989 Edition
Fire Protection Handbook		

4.3 CODE OF FEDERAL REGULATIONS (CFR):

29 CFR 1910	Occupational Safety and Health Administration (OSHA) Regulations, July 1, 1992
29 CFR 1910	Subpart L - OSHA Regulations, Fire Protection, July 1, 1992
29 CFR 1926	Safety and Health Regulations for Construction (OSHA), July 1, 1992

4.4 FACTORY MUTUAL ENGINEERING CORPORATION (FM):

Loss Prevention Data Sheets

Approval Guide 1993 Edition

4.5 UNDERWRITERS LABORATORIES, INC. (UL):

UL 142	Steel Above Ground Tanks for Flammable and Combustible Liquids	1993 Edition
UL Fire Protection Equipment Directory		1993 Edition
UL Fire Resistance Directory		1993 Edition
UL Building Materials Directory		1993 Edition

4.6 UNIFORM BUILDING CODE (UBC) - 1991 EDITION

4.7 UNIFORM FIRE CODE (UFC) - 1990 EDITION

5. DESIGN INPUTS

5.1 ESF BFD document, CRWMS M&O Document No. BAB000000-01717-6300-00002, Rev. 05, Section 7.2.4.1

5.2 DOE Order 5480.7A Requirements

5.2.1 A DOE facility shall be characterized by a level of fire protection sufficient to fulfill the requirements for the best protected class of industrial risks (Highly Protected Risk/Improved Risk). This program is characterized by the inclusion of

a continuing, sincere interest on the part of management and employees in minimizing losses from fire and related perils and the inclusion of preventive features necessary to assure the satisfaction of objectives related to safety.

5.2.2 The DOE Fire Protection Program shall meet or exceed the minimum requirements established by the NFPA as directed by the PSO. Basic requirements shall include a reliable water supply of acceptable capacity for fire suppression; noncombustible construction of an acceptable nature for the occupancy of the facility; automatic fire extinguishing systems; a fully staffed, trained, and equipped emergency response force; a means to summon the emergency response force in the event of a fire; and a means to notify the building occupants to evacuate in the event of a fire. For areas subject to significant life safety risks, serious property damage, program interruption, or loss of safety class equipment as defined in the relevant facility SAR, additional protection measures may be deemed necessary as determined by the AHJ.

5.2.3 This level of protection also includes administrative procedures encompassing controls for hazardous substances/processes; inspection, maintenance, and testing of fire protection features; and other programmatic fire safety activities as defined below.

5.2.3.1 **Fire Department** - A fully staffed, trained, and equipped fire department/REECo Fire Protection Services shall service all DOE facilities, except as determined by the PSO. (Refer to the fire protection positions on minimum staffing levels in the DOE Fire Protection Resource Manual.)

5.2.3.2 **Fire Department Water Supply** - An automatic water supply for fire protection having a minimum two hours stored water capacity shall be maintained. Water supply is provided from the ESF construction/fire water tank. Well water at Area 25 of the Nevada Test Site is pumped to the ESF construction/fire water tank. Facilities having an MPFL in excess of $50 million shall be provided with an additional, independent source of fire protection water.

5.2.3.2.1 A water supply dedicated to fire protection may be necessary as determined by the PSO. A dedicated system shall be able to meet hose stream and sprinkler system demands.

5.2.3.2.2 A combined fire and process/domestic system shall be able to deliver the fire demand plus the maximum daily domestic demand for the required duration.

5.2.3.3 Underground Piping - Mains shall be sized for the largest fire flows anticipated but in no case shall they be less than 8-inch diameter. Supply piping to individual fire sprinkler systems shall be at least as large as the fire sprinkler system riser.

5.2.3.4 Liquid Run-off Control - Natural or artificial means of controlling liquid run-offs from a maximum credible fire shall be provided so that contaminated or polluting liquids will not escape the site, including potentially contaminated water resulting from fire fighting operations. The amount of fire water that must be controlled and the design of the containment systems shall be determined based on consultations with the cognizant DOE fire protection engineer.

5.2.3.5 Fire Alarm Systems - Where fire suppression or fire alarm systems are provided, local alarms in the protected area and alarm transmission to an acceptable remote attended location shall be provided.

5.2.3.6 Impairment Control - A fire protection system impairment program shall be provided for control of operations and tracking of impairments during periods when fire protection systems are out of service.

5.3 Seismic Design Criteria - The equipment shall be designed for UBC Seismic Zone 3 requirements.

5.4 Wind Design Criteria - The equipment shall be designed for an 80 MPH basic wind speed, Exposure "C".

6. CRITERIA

This document describes the methodology, structure, and responsibilities for performing fire hazard analysis to meet the requirements of DOE Orders 5480.7A, Section 9, 6430.1A, Section 0110-6.2, 0111-99.0.1, 1300-1.3, and 1530, and 4700.1. A fire hazard analysis shall review the facility fire protection and life safety features by fire area to assess compliance with DOE orders, national standards, and local site requirements.

6.1 A fire hazard analysis shall be performed to comprehensively assess the risks from fire within individual fire areas in the ESF project so as to ascertain whether the objectives of DOE Order 5480.7A are met.

6.2 A fire hazard analysis shall be performed for all new facilities as directed by DOE Order 6430.1A and the AHJ.

6.3 A fire hazard analysis shall be performed to provide the supporting documentation for the fire protection system selection in accordance with the ESF Basis For Design (BFD) Civilian Radioactive Waste Management System (CRWMS) Management and Operating Contractor (M&O) Document No. B00000000-01717-6300-00002.

7. ASSUMPTIONS

The diesel fuel stored in the storage tank is classified as a combustible liquid. Since the ambient temperatures in the area are above 100 degrees F, the tank is insulated to limit the temperature rise. As the final design of the tank has not been completed, the assumption has been made that the maximum temperature of the diesel fuel will not exceed 100 degrees F.

8. REFERENCES

8.1 ESFDR Document, YMP/CM-0019, Rev. 0

8.2 Engineering Drawings for ESF Design Package 1D

8.3 Attachment I - ESF Design Package 1D Cost Estimate

8.4 Specification Section 15482 Diesel Fuel Oil System

8.5 Specification Section 15060 Mechanical Piping

8.6 Specification Section 15260 Piping Insulation

8.7 Specification Section 16405 NEMA Frame Induction Motors (Small)

8.8 Specification Section 16152 Packaged Mechanical Equipment

8.9 Specification Section 16622 Packaged Engine Generator Systems

8.10 Determination of Important Evaluation (DIE) for ESF North Portal Pad, Document No. BABB00000-01717-2200-00001, Rev. 04A, Section 11.3

9. COMPUTER PROGRAMS

Not applicable.

10. DESIGN ANALYSIS

10.1 DIESEL FUEL OIL SYSTEM DESCRIPTION

10.1.1 General

10.1.1.1 The diesel fuel oil system provides diesel fuel to the standby generators.

10.1.1.2 All electrical equipment is UL listed and shall bear the UL label. Electrical components, controls, construction, and design are in accordance with Specification Sections 16152 and 16405.

10.1.1.3 All components of the system are restrained to meet UBC Seismic Zone 3 requirements.

10.1.1.4 All components of the system are suitable for outdoor installation.

10.1.2 Main Fuel Oil Storage Tank

10.1.2.1 One horizontal 10,000-gallon (nominal) carbon steel tank for above ground installation is provided as shown on the Drawings. The tank has secondary containment construction (Type II), or equivalent, and is fabricated in accordance with the requirements of UL 142 and NFPA 30. The tank is self-contained and is designed to satisfy all requirements of NFPA 30, Paragraph 2-3.4.1, Exception No. 2.

10.1.2.2 The fuel oil storage tank is provided with the following connections:

- Two, 2-inch diameter by 8-foot long vent stacks (primary and secondary tanks)
- 4-inch brass and iron lockable fill cap with overspill protection
- 8-inch emergency relief vent
- 2-inch liquid level port
- 2-inch secondary tank leakage monitoring port
- 4-inch supply and return
- 2-inch relief valve return
- 4-inch overflow return
- 4-inch primary drain
- 2-inch secondary drain
- 8-inch secondary tank emergency relief vent
- 24-inch manhole access

10.1.3 Day Tanks (Future)

Day tanks and associated instrumentation to support the operations of standby generators (GN-401 through GN-408) will be analyzed later in a revision to this document.

10.2 DIESEL FUEL PUMPS

A total of three diesel fuel pumps are employed; rated 1 horsepower, 460 volts, 3 phase, 60 Hertz, 10 GPM, and a head pressure of 50 psig. All pumps are supplied with standby power. One pump is in reserve.

10.3 FIRE AREA DESCRIPTIONS AND FEATURES

10.3.1 The diesel fuel storage tank pad is located approximately 30 feet north of the standby generator pad; only 15 feet is required by NFPA 30. The pump pads are immediately west of the storage tank.

10.3.1.1 The diesel storage tank is constructed with secondary containment and is listed by UL in accordance with UL 142 and is installed in accordance with the requirements of NFPA 30.

10.3.1.2 The tank contains a diesel fuel classified as a combustible liquid in accordance with the definitions of NFPA 30.

10.3.1.3 No special extinguishing systems are required to protect either the tanks or any adjacent exposure.

10.3.1.4 The tank is separated to limit exposure damage in case of a fire. The tank pad is separated from adjacent structure to prevent exposure from fire-related incidents, in accordance with NFPA 80A, Uniform Fire Code Tables 79.503A and 79.503F, and BFD Section 7.2.4.1.IV.18 for maintenance.

10.3.1.5 The water supply for the permanent fire protection installation is provided by a dedicated source with sufficient capacity (based on maximum demand) for fire fighting until other sources become available.

10.3.2 Yard hydrants are provided at a minimum space of 400 feet. Location of the hydrants considers the possible locations of fires outside. Hydrant demands comply with DOE Order 6430.1A, Section 1530-3.3.3.

10.3.3 Portable Fire Extinguishers

Two portable fire extinguishers rated 4A/40B:C are provided as required and comply with NFPA 10.

10.3.4 Water System

A separate firewater and construction water system supplies water for fire protection. Lines or subsystems handling water for fire protection have a minimum earth cover of three feet.

10.4 FIRE HAZARDS

10.4.1 Description

The diesel fuel supply tank is designed in accordance with applicable NFPA and ASME codes and standards. Combustible liquids are in suitably listed containers with spill protection and electrical equipment is suitably listed and classified. The tank spacing is based on complying with UFC Tables 79.503A and 79.503F. The tank construction and spacing are the same for either a Type I or Type II flammable or combustible liquid.

10.4.2 Mitigation

Yard hydrants and portable fire extinguishers are provided. Two fire extinguishers are rated minimum 4A 40B:C in accordance with NFPA 10. The pad for the diesel fuel supply tank is approximately 400 feet from the tunnel entrance and does not endanger the portal entrance. Liquid runoff control is provided by sloping all areas away from the North Portal entrance. The double wall tank design and tank foundation design protects the tank from the effects of runoff.

10.4.3 Life Safety Considerations

The tank is located in an open area.

10.4.4 Essential Safety Class Systems

The diesel fuel supply tank for the standby generators and air compressors does not supply any essential safety class systems.

10.5 DAMAGE POTENTIAL

10.5.1 Maximum Possible Fire Loss

The estimated value in 1994 dollars of the tank and accessories is $100,000.

10.5.2 Largest Possible Fire Loss

This can be expected to be the same as the maximum possible fire loss since the facility does not include materials or processes that would add significant costs for cleanup or decontamination.

10.5.3 Maximum Credible Fire Loss

The maximum credible fire loss for the diesel fuel supply tank would be the loss of the tank and accessories plus cleanup costs or $115,000.

10.6 FIRE DEPARTMENT RESPONSE

Since the minimum possible response time for the REECo fire department would exceed 45 minutes, no credit is taken for any mitigation by the fire department.

10.7 RECOVERY POTENTIAL

No adverse recovery time is required to be mitigated.

10.8 FIRE RELATED POTENTIAL

No toxic, biological, or radiation releases are possible due to a fire in this area. No special emergency planning or security precautions are required. The fuel storage system is designed for outdoor installation and seismic constraints in accordance with UBC Seismic Zone 3 requirements. The units are separated from each other and adjacent areas in accordance with NFPA 80A and NFPA 30. The impact to adjacent areas and structures from fire and natural hazards has been adequately mitigated by design in accordance with the above referenced codes.

11. CONCLUSIONS

The ESF North Portal does not exhibit any unusual hazards or unmitigated loss potential that exceeds the guidelines of an "improved risk" as defined by DOE Order 5480.7A. The potential impacts on fire safety caused by natural hazards, such as, earthquakes, flood, and winds are limited and have been mitigated by the design of the North Portal Storage System.

12. ATTACHMENTS

ATTACHMENT	TITLE	
I	FUEL STORAGE SYSTEM - ESF DESIGN PACKAGE 1D COST ESTIMATE	15 PAGES

ATTACHMENT I

FUEL STORAGE SYSTEM - ESF DESIGN
PACKAGE 1D COST ESTIMATE

DEPT. OF ENERGY
YUCCA MOUNTAIN SITE, NEV.
CRWMS

COST ESTIMATE SUMMARY

90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

CONTRACT 94000824
BY: JOHN HEUSNER
DATE: 08/16/94
REVIEWED BY:
REV: 01

ACCT.	DESCRIPTION	MHR'S	LABOR DOLLARS	SUBCONT'R DOLLARS	MATERIAL DOLLARS	TOTAL DOLLARS	
00	CIVIL & EXCAVATION	20,886	$833,820		$298,993	$1,232,800	
10	CONCRETE	7,710	$162,618		$236,029	$397,600	
20	STRUCTURAL	40	$1,096		$3,656	$4,700	Rev:01
30	BUILDINGS / ARCHITECTURAL						
30	FIRE SPRINKLERS						
40	EQUIPMENT	98	$2,346		$33,003	$36,300	Rev:01
60	PIPING	2,169	$36,146	$3,600	$12,301	$61,000	
66	ELECTRICAL	1,864	$41,721		$97,573	$139,300	Rev:01
70	INSTRUMENTS / CONTROLS	600	$14,366		$25,373	$39,800	
80	PAINT	24	$496		$200	$700	
85	INSULATION	578	$12,346		$4,938	$17,300	Rev:01
200	HVAC						
	TOTAL DIRECT FIELD COSTS	33,899	$1,293,799	$3,600	$711,000	$1,918,200	Rev:01
	EQUIPMENT RENTAL					$199,600	Rev:01
	LABOR LOAD					$899,700	Rev:01
	SALES TAX & FREIGHT					$86,300	Rev:01
	MATERIAL HANDLING					$297,000	Rev:01
	G & A SUBCONTRACTORS					$400	
	G & A					$647,100	Rev:01
	SUBSISTANCE					$89,500	
	TOTAL INDIRECT FIELD COSTS					$2,021,000	Rev:01
	CONTINGENCY @ 10.00%					$393,900	Rev:01
	TOTAL FIELD COSTS					$4,333,100	Rev:01

NOTES:

1. Wage rates are based on REECo Labor Agreements dated 10/1/93. The crew rates are adjusted for foreman and include a 2% max. overtime allowance.
2. Indirect costs are based on REECo loads dated 6/1/94
3. Diesel fuel storage tank and condensate tank are included in this estimate .
4. Pumps and platform @ diesel fuel storage tank are included in this estimate.
5. Pumps at condensate tank are not included in this estimate.

CRWMS1D.WK4

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, N
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04560824
BY: JOHN HEUSNER
DATE: 08/15/94

A/C NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBLET	TOTAL
00	EXCAVATION											
	ROADWAY AT MUCK STORAGE AREA											
	REMOVE TOPSOIL & STOCKPILE	79,279	CY			0.26	22,190	$18.42	$408,889			$408,889
	EXCAVATION (NORMAL SOILS)	16,157	CY			0.23	3,716	$18.42	$68,451			$68,451
	COMPACT EXISTING GRADE	50,156	SY			0.22	11,034	$18.42	$203,252			$203,252
	COMMON FILL	39,389	CY			0.26	10,241	$18.42	$188,642			$188,642
	SELECT FILL	10,311	CY	$25.50	$262,931	0.26	2,681	$18.42	$49,381			$312,312
	RIP RAP	185	CY	$20.20	$3,737	0.26	48	$18.42	$886			$4,623
	CORRUGATED METAL PIPE, 36"	69	LF	$33.50	$2,211	0.26	18	$18.42	$340			$2,551
	STRUCTURAL EXCAVATION	61	CY			0.15	9	$18.42	$169			$169
	STRUCT SELECT BACKFILL	39	CY	$25.60	$996	0.26	11	$18.42	$201			$1,198
	ELECTRICAL DUCT BANKS											
	MACHINE TRENCHING	944	CY			0.16	142	$18.42	$2,608			$2,608
	HAUL & DUMP	1,088	CY			0.06	65	$18.42	$1,200			$1,200
	SAND FILL	342	CY	$28.50	$9,747	0.22	75	$18.42	$1,386			$11,133
	SELECT FILL	744	CY	$25.60	$18,972	0.26	206	$18.42	$3,837			$22,809
	AUGER HOLES 28" DIA. X 7'	9	EA			1.00	9	$18.42	$166			$166
	AUGER HOLES 28" X 8'	15	EA			1.00	15	$18.42	$276			$276
	6"W, 4 MIL POLY WARNING TAPE	4,000	LF	$0.10	$400	0.01	40	$18.42	$737			$1,137
	MAT FOUNDATIONS											
	EXCAVATION	793	CY			0.15	119	$18.42	$2,191			$2,191
	HAUL & DUMP	912	CY			0.06	55	$18.42	$1,008			$1,008
	TOTAL ACCOUNT 00				$298,993		50,695		$933,620			$1,232,613

CRWMS1D.WK4

CONCEPTUAL ESTIMATE PACKAGE #	QUANTITY SURVEY	DATE PRINTED: 08/15/94 DATE PREPARED: 07/25/94 REVISION #
CLIENT: DEPT OF ENERGY LOCATION: YUCCA MOUNTAIN SITE, NEVAD PROJECT: CRWMS	ROADWAY AT MUCK STORAGE AREA	CONTRACT# 04580824 ESTIMATED BY: JOHN HEUSNER REVIEWED BY: DRAWING #: 21000-20068 - 08 TO 21000-20078-08

COD ITEM	UNIT	LENGTH	WIDTH	HEIGHT	# UNITS	TOTAL QUANTITY	PRICING QUANTITY
REMOVE TOPSOIL							
AT ROADBED	CUFT	8,700	48	1	1.00	417,600	
AT MUCK STORAGE AREA	CUFT	2,571	1,285	1	0.50	1,651,868	
AT V DITCH	CUFT	4,657	8	1	1.00	37,256	
AT CONVEYOR ALIGNMENT	CUFT	600	23	1	1.00	13,800	
AT CONVEYOR ALIGNMENT	CUFT	1,000	40	1	0.50	20,000	
					TOTAL	2,140,524	79,279 CY
EXCAVATION (NORMAL SOILS)							
AT ROADBED	CUFT	8,700	48	1	1.00	417,600	
AT V DITCH	CUFT	4,657	8	1	0.50	18,628	
					TOTAL	436,228	16,157 CY
COMPACT EXISTING GRADE							
AT ROADBED	SF	8,700	48	1	1.00	417,600	
AT CONVEYOR ALIGNMENT	SF	600	23	1	1.00	13,800	
AT CONVEYOR ALIGNMENT	SF	1,000	40	1	0.50	20,000	
					TOTAL	451,400	50,156 SY
COMMON FILL							
AT ROAD BED TYPICAL (1'0" DEPTH)	CUFT	4,350	48	1	1.00	208,800	
AT ROAD BED FROM STA # 0 TO STA #5	CUFT	500	65	15	1.00	487,500	
AT ROADBED FROM STA #5 TO STA #12	CUFT	600	65	4	1.00	156,000	
AT 2:1 FILL AREA (STA #0 TO STA #5)	CUFT	500	40	20	0.50	200,000	
AT 2:1 FILL AREA (STA #5 TO STA #12)	CUFT	700	8	4	0.50	11,200	
					TOTAL	1,063,500	39,389 CY
SELECT FILL							
AT ROADBED TYPICAL (1'0" DEPTH)	CUFT	8,700	32	1	1.00	278,400	
					TOTAL	278,400	10,311 CY
RIP RAP							
AT ROAD JUNCTION	CUFT	100	17	2	1.00	3,400	
AT CROSS CULVERT	CUFT	20	20	2	2.00	1,600	
					TOTAL	5,000	185 CY
CROSS CULVERT 36" DIAMETER							
36" CORRUGATED METAL PIPE	LF	66	1	1	1.00	66	
					TOTAL	66	66 LF
STRUCTURAL EXCAVATION	CUFT	66	5	5	1.00	1,650	
					TOTAL	1,650	61 CY
STRUCTURAL BACKFILL	CUFT	66	1	5	2.00	660	
		66	3	2	1.00	396	
					TOTAL	1,056	39 CY

NOTES:
1 CONVEYOR EXCLUDED
2 STACKER EXCLUDED
3 ESTIMATE INCLUDES CUT AND FILL AT ROADBED AND V DITCH AS "NORMAL". "ROCK" EXCAVATION IS EXCLUDED.

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04580824
BY: JOHN HEUSNER
DATE: 08/16/94

A/C NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBLET	TOTAL
10	CONCRETE											
	AREA LIGHT POLE FOUNDATIONS	38	CY	$130.00	$5,070	8.00	312	$21.08	$6,577			$11,647
	MAT FOUNDATIONS	681	CY	$170.00	$116,770	10.00	6,810	$21.08	$143,565			$260,335
	40 MIL PVC LINER	14,226	SF	$8.00	$113,808	0.04	569	$21.08	$11,995			$125,803
	CMU WALL	128	SF	$2.96	$381	0.16	19	$21.08	$391			$772
	TOTAL ACCOUNT 10				$236,029		7,710		$162,618			$387,647

CONCEPTUAL ESTIMATE PACKAGE # 1-D	QUANTITY SURVEY	DATE PRINTED: 07/25/94 DATE PREPARED: 07/25/94 REVISION #
CLIENT: DEPT OF ENERGY LOCATION: YUCCA MOUNTAIN SITE, NEVADA PROJECT: CRWMS	CONCRETE WORK	CONTRACT# 04580824 ESTIMATED BY: JOHN HEUSNER REVIEWED BY:

ITEM	UNIT	LENGTH	WIDTH	HEIGHT	# UNITS	TOTAL QUANTITY	PRICING QUANTITY
CONCRETE							
TRANSFORMER FDNS DET #1 (SEE MTO ATTACHED)	CY	1	1	1	405.00	405	15
TRANSFORMER FDNS DET #2 (SEE MTO ATTACHED)	CY	1	1	1	405.00	405	15
TRANSFORMER FDNS DET # 3(SEE MTO ATTACHED)	CY	1	1	1	540.00	540	20
GENERATOR FDN (SEE MTO ATTACHED)	CY	1	1	1	3,780.00	3,780	140
COMPRES. AIR & CONDENSATE RCVR PADS (SEE MTO)	CY	1	1	1	12,582.00	12,582	466
DIESEL FUEL STORAGE	CY	25	11	1.67	1.00	459	17
• • •	CY	5	11	1.67	1.00	92	3
• • • PUMP PAD	CY	5	8	0.50	1.00	20	1
• • • TANK PAD	CY	15	8	0.50	1.00	60	2
• • • CURB	CY	31	0.5	2.00	1.00	31	1
• • • CURB	CY	20	0.5	1.50	1.00	15	1
• • • CURB	CY	31	0.5	0.50	1.00	8	0
TOTAL						18,397	681 CY
LINER							
TRANSFORMER FDNS DET #1 (SEE MTO ATTACHED)	SF	34	21	1	1.00	714	
TRANSFORMER FDNS DET #2 (SEE MTO ATTACHED)	SF	30	20	1	1.00	600	
TRANSFORMER FDNS DET # 3(SEE MTO ATTACHED)	SF	20	20	1	1.00	400	
GENERATOR FDN (SEE MTO ATTACHED)	SF					4,700	
COMPRES. AIR & CONDENSATE RCVR PADS (SEE MTO)	SF					7,200	
DIESEL FUEL STORAGE	SF	36	17	1	1.00	612	
TOTAL						14,226	14,226 SF
EXCAVATION							
TRANSFORMER FDNS DET #1 (SEE MTO ATTACHED)	CY					13	
TRANSFORMER FDNS DET #2 (SEE MTO ATTACHED)	CY					8	
TRANSFORMER FDNS DET # 3(SEE MTO ATTACHED)	CY					15	
GENERATOR FDN (SEE MTO ATTACHED)	CY					248	
COMPRES. AIR & CONDENSATE RCVR PADS (SEE MTO)	CY					485	
DIESEL FUEL STORAGE	CY	30	11	2	1.00	24	
TOTAL						793	793 CY
CMU WALL TOTAL	SF	16	8	1	1.00	128	128 SF
TRENCH COVER GRATING. 1 1/4" X 3/16"	SF	10	1	1	2.00	20	20 SF
	SF	14	1	1	1.00	14	14 SF
TOTAL						34	34 SF

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04508024
BY: JOHN HEUSNER
DATE: 08/15/94

A/C NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR MH	LABOR UNIT HOURS	LABOR TOTAL HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJECT	TOTAL
20	STRUCTURAL STEEL												
	TRENCH COVER GRATINGS	34	SF	$2.86	$100	0.06	2	$22.62	$38				$138
Rev. 01	STAIRS @ DIESEL FUEL TANK	19	RSR	$70.00	$1,280	0.814	16	$22.62	$370				$1,650
Rev. 01	PLATFORM @ DIESEL FUEL TANK	3,000	LB	$0.72	$2,160	0.01	31	$22.62	$687				$2,863
	TOTAL ACCOUNT 20				$3,560		49		$1,095				$4,651

Rev. 01

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1984

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

FLUOR DANIEL, INC
CONTRACT: 04500824
BY: JOHN HEUSNER
DATE: 07/25/84

ACC NO	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJECT	TOTAL
20	STRUCTURAL STEEL											
	TRENCH COVER GRATINGS	34	SF	$2.86	$100	0.06	2	$22.42	$38			$138
	TOTAL ACCOUNT 20				$100		2		$38			$138

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT 04500824
BY: JOHN HEUSNER
DATE: 08/10/94

A/C NO	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJECT	TOTAL
40	EQUIPMENT - Rev#1											
	1,800 GAL DBL WALL "JOOR" CONDENSATE TANK	1	EA	$7,464	$7,464	0.00	0	$24.43	$196			$7,649 Rev. 01
	10,000 GAL DBL WALL "JOOR" DIESEL FUEL TANK	1	EA	$16,333	$16,333	18.00	18	$24.43	$391			$16,724 Rev. 01
	FUEL TRANSFER PUMP, 10 GPM, 34 HP, 480V	3	EA	$3,072	$9,216	24.00	72	$24.43	$1,759			$10,975 Rev. 01
	TOTAL ACCOUNT 90				$32,953		90		$2,346			$35,349 Rev. 01

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04500824
BY: DICK WOODCOCK
DATE: 07/21/94

A/C NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBLET	TOTAL
89	PIPING											
	FUEL SYSTEM PIPING											
	PIPE ERW SCH 40 C STL A-53 GR B WITH 0.8	16	LF	$1.71	$28	0.50	8	$27.00	$203			$229
	3000# SW FITTINGS 0.75	35	LF	$1.73	$61	0.61	21	$27.00	$576			$637
	-DITTO- 1	20	LF	$2.13	$43	0.66	13	$27.00	$356			$399
	-DITTO- 2	55	LF	$2.62	$139	0.71	39	$27.00	$1,054			$1,193
	PIPE ERW SCH 40 C STL A-53 GR B WITH 4	180	LF	$8.70	$1,748	1.48	266	$27.00	$7,193			$8,939
	STD WT FITTINGS											
	FLANGES C STL 150# RF 0.8	8	EA	$10.50	$84	0.30	2	$27.00	$65			$149
	-DITTO- 0.75	8	EA	$10.50	$84	0.30	2	$27.00	$65			$149
	-DITTO- 1	7	EA	$10.60	$74	0.30	2	$27.00	$57			$131
	-DITTO- 2	8	EA	$10.50	$83	0.40	2	$27.00	$65			$128
	-DITTO- 4	3	EA	$18.25	$49	0.80	2	$27.00	$65			$114
	PIPE ERW SCH 40 C STL A-53 GR B 4	360	LF	$3.67	$1,285	0.30	108	$27.00	$2,916			$4,201
	(RACK)											
	GATE VA 1258 SCRD BRONZE BODY 0.6	2	EA	$8.79	$14	0.50	1	$27.00	$27			$41
	-DITTO- 1	11	EA	$10.88	$119	0.80	9	$27.00	$238			$357
	-DITTO- 1.5	1	EA	$18.36	$18	1.20	1	$27.00	$32			$50
	-DITTO- 2	2	EA	$24.73	$49	1.80	3	$27.00	$86			$135
	GATE VA 1500 RF STL F6 TRIM 4	1	EA	$301.80	$302	2.60	3	$27.00	$70			$382
	CHECK VA 1508 SCRD BRONZE BODY 1	3	EA	$23.09	$69	0.80	2	$27.00	$65			$134
	CHECK VA 1500 SCRD BRONZE BODY 2	1	EA	$58.92	$59	1.60	2	$27.00	$43			$102
	GLOBE VA 1508 SCRD BRONZE BODY 0.6	1	EA	$14.36	$14	0.50	1	$27.00	$14			$28
	PAGE TOTAL ACCOUNT 89				$4,300		488		$13,190			$17,678

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04S0824
BY: DICK WOODCOCK
DATE: 07/21/94

ACC NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJECT	TOTAL
60	PIPING				$4,280		490		$13,190			$17,470
	FUEL SYSTEM PIPING (CONT'D)											
	Y STRAINER 150 SCRD BRONZE BODY 1.0	1	EA	$60.00	$60	1.20	1	$27.00	$32			$112
	LABOR ONLY ITEMS											
	PSV 150 SCRD 0.78	3	EA			0.80	3	$27.00	$73			$73
	SOLENOID VA 0.8	4	EA			0.80	3	$27.00	$86			$86
	SOLENOID VA 0.78	1	EA			0.80	1	$27.00	$24			$24
	FUEL SYSTEM PIPING TOTAL				$4,280		497		$13,466			$17,873
	DRAIN SYSTEM PIPING											
	PIPE PBW SCH 40 C STL A53 GR B WSTM 0.78	300	LF	$1.73	$618	0.01	183	$27.00	$4,941			$5,460
	3000# BW FITTINGS 1.0	70	LF	$2.31	$162	0.09	49	$27.00	$1,304			$1,466
	-DITTO- 2	110	LF	$2.62	$277	0.71	78	$27.00	$2,109			$2,386
	PIPE PBW SCH 40 C STL A53 GR B WSTM 4	10	LF	$8.70	$87	1.46	15	$27.00	$400			$487
	RED WT FITTINGS											
	FLANGES C STL 150# RF 1.0	8	EA	$10.00	$84	0.30	2	$27.00	$66			$149
	-DITTO- 2	1	EA	$10.00	$11	0.40	0	$27.00	$11			$22
	-DITTO- 4	1	EA	$16.28	$18	0.80	1	$27.00	$22			$38
	GATE VA 1200 SCRD BRONZE BODY 0.78	8	EA	$12.88	$103	0.80	6	$27.00	$130			$233
	-DITTO- 1.0	10	EA	$16.38	$166	1.20	12	$27.00	$324			$308
	-DITTO- 2	1	EA	$24.73	$26	1.80	2	$27.00	$43			$69
	GATE VA 150 SRF RTL FB TRIM 3	1	EA	$316.88	$317	1.80	2	$27.00	$61			$378
	PAGE TOTAL ACCOUNT 60				$1,790		346		$6,466			$11,190

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04500824
BY: DICK WOODCOCK
DATE: 07/21/94

ACC NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJECT	TOTAL
88	PIPING DRAIN SYSTEM PIPING (CONT'D)				$1,796		240		$9,400			$11,196
	CHECK VA 1008 SCRD BRONZE BODY	36	EA	$17.13	$617	0.80	22	$27.00	$593		$1,200
	CHECK VA 1008 SCRD BRONZE BODY	2	EA	$38.88	$78	1.20	2	$27.00	$65		$144
	CHECK VA 1008 RF FIL. BRNZ TYPE	1	EA	$370.17	$370	2.80	3	$27.00	$70		$440
	Y STRAINER 100 SCRD BRONZE BODY	1	EA	$60.00	$60	1.20	1	$27.00	$32		$112
	DRAIN SYSTEM PIPING TOTAL				$2,941		276		$16,160			$19,081
	SUB-TOTAL ACCOUNT 88				$7,460		872		$23,660			$36,964
	BOLT & GASKETS ALLOWANCE	1	LOT	$100.00	$100							$100
	PIPE MARKERS	46	EA	$10.00	$460	0.80	23	$27.00	$620			$1,080
	VALVE NUMBER/SYSTEM IDENTIFICATION	82	EA	$18.00	$1,246	0.80	42	$27.00	$1,121			$2,368
	CLEANING & TESTING 8"2 X 7%					0.81	61	$27.00	$1,648			$1,648
	HANGER GUIDES MISC SUPPORTS ETC LARGE -MATL				$1,047		87	$27.00	$2,348			$3,395 $1,047
	MOB DEMOB	1	LOT							$3,000	$3,000	$3,000
	SUB-TOTAL ACCOUNT 88				$9,507		1,000		$26,268		$3,000	$42,639
	MTO ALLOWANCE 20%				$1,902		217		$6,468		$600	$8,308
	TOTAL ACCOUNT 88				$12,301		2,169		$36,146		$3,000	$61,047

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE 81D
DATED JULY 11, 1994

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

FLUOR DANIEL, INC
BY: GEORGE NAVADAD
DATE: 08/15/94
CONTRACT: 0458083

ACC NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJET	TOTAL
00	ELECTRICAL - PKG 1D											
	POWER	1	LOT	9820	9820	23.00	23	$26.00	$577			$1,197
	LIGHTING	1	LOT	$76,900	$76,900	748.00	748	$26.00	$18,706			$95,765
	GROUNDING	1	LOT	$6,000	$6,000	700.00	700	$26.00	$18,081			$24,081
	ELEC HEAT TRACING	1	LOT	$4,000	$4,000	88.00	80	$26.00	$1,284			$5,284
Rev 01	ELEC HEAT TRACING @ COND. & DIESEL TANKS	618	LF	$12.66	$10,472	0.10	62	$26.00	$2,044			$12,517 Rev 01
	TOTAL ACCOUNT 00				$97,472		1,984		$41,731			$139,204 Rev 01

Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04500624
BY: JOHN HEUSNER
DATE: 08/12/94

ACC NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJECT	TOTAL
70	INSTRUMENTS / CONTROLS											
	DIESEL FUEL & DRAIN SYSTEM											
	24 FIELD INST WITH BULK MAT'L	1	LOT	2537.2	2537.2	880.00	880	525.71	914.396			5308.771
	TOTAL ACCOUNT 70			2537.2	2537.2		880		914.396			5308.771

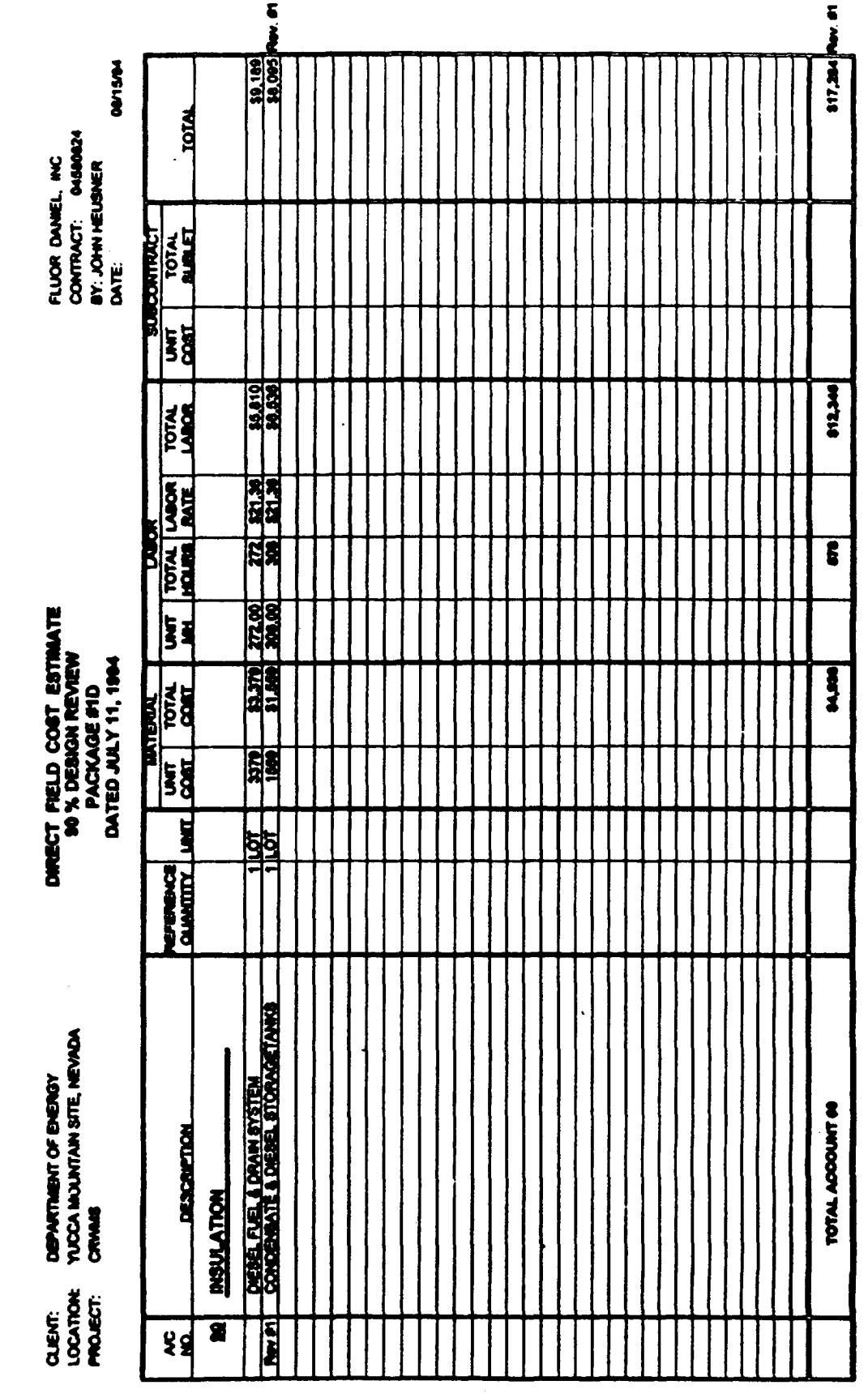
Title: North Portal Fuel Storage System Fire Hazard Analysis-ESF Surface Design Package 1D

CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04500824
BY: JOHN HEUSNER
DATE: 09/12/94

A/C NO.	DESCRIPTION	REFERENCE QUANTITY	MATERIAL UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR MH	LABOR UNIT HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBJECT	TOTAL
80	PAINTING											
	DIESEL FUEL & DRAIN SYSTEM	1 LOT		$200.00	$200	24.00	24	$20.73	$498			$698
	TOTAL ACCOUNT 80			$200		24			$498			$698



CLIENT: DEPARTMENT OF ENERGY
LOCATION: YUCCA MOUNTAIN SITE, NEVADA
PROJECT: CRWMS

DIRECT FIELD COST ESTIMATE
90 % DESIGN REVIEW
PACKAGE #1D
DATED JULY 11, 1994

FLUOR DANIEL, INC
CONTRACT: 04500624
BY: JOHN HEUSNER
DATE: 08/15/94

A/C NO.	DESCRIPTION	REFERENCE QUANTITY	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL COST	LABOR UNIT MH	LABOR TOTAL HOURS	LABOR RATE	LABOR TOTAL LABOR	SUBCONTRACT UNIT COST	SUBCONTRACT TOTAL SUBLET	TOTAL
90	INSULATION											
	DIESEL FUEL & DRAIN SYSTEM	1	LOT	3370	$3,370	272.00	272	$21.30	$5,810			$9,180
Rev. 01	CONDENSATE & DIESEL STORAGE TANKS	1	LOT	1800	$1,800	300.00	300	$21.30	$6,530			$8,095 Rev. 01
	TOTAL ACCOUNT 90				$4,500		572		$12,340			$17,284 Rev. 01