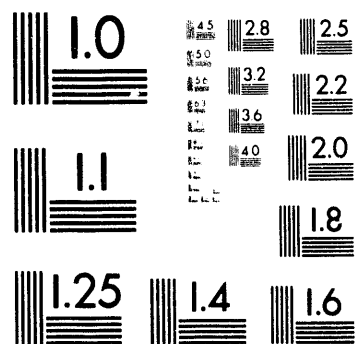




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SYSTEMATIC EVALUATION PROGRAM (SEP) AT ROCKY FLATS PLANT:
AN OVERVIEW OF PRACTICAL MANAGEMENT ISSUES FOR
EVALUATION OF NATURAL PHENOMENA HAZARDS

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Overview

The Defense Nuclear Facilities Safety Board (DNFSB) recommended that a Systematic Evaluation Program be developed and implemented at the Rocky Flats Facility (DNFSB Recommendation 90-5). EG&G has established the Systematic Evaluation Program (SEP) to carry out this recommendation by developing various programmatic plans based on the DOE Implementation Plan and DOE Management Plan.

Many of the buildings at the Rocky Flats Plant were designed and built before modern standards were developed, including standards for protection against extreme natural phenomenon such as tornados, earthquakes, and floods. The purpose of the SEP is to establish an integrated approach to assessing the design adequacy of specific high and moderate hazard Rocky Flats facilities from a safety perspective and to establish a basis for defining any needed facility improvements. The SEP is to be carried out in three Phases. In Phase 1, topics to be evaluated and an evaluation plan for each topic were developed. Any differences between Current Design Requirements (CDR) or acceptance criteria and the design of existing facilities, will be identified during Phase 2 and assessed using an integrated systematic approach during Phase 3. The integrated assessment performed during Phase 3 provides a process for evaluating the differences between existing facility design and CDRs so that decisions on corrective actions can be made on the basis of relative risk reduction and cost effectiveness. These efforts will ensure that a balanced and integrated level of safety is achieved for long-term operation of these buildings. Through appropriate selection of topics and identification of the structures, systems, and components to be evaluated, the SEP will address outstanding design issues related to the prevention and mitigation of design basis accidents, including those arising from natural phenomena. The objective of the SEP is not to bring these buildings into strict compliance with current requirements, but rather to ensure that an adequate level of safety is achieved in an economical fashion.

The SEP interfaces with other Rocky Flats programs such as the standards program, the Configuration Change Control Program, the Vital Safety System Operability Verification program, the Final Safety Analysis program, and the Safety Analysis Report Upgrade program.

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By Sheldeneanu UNU

Date 7-29-93

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Detailed Discussion

The SEP at RFP is being conducted in three phases:

- Phase 1: Development of the Topics List and the Topic Evaluation Plans,
- Phase 2: Evaluation of the Topics, and
- Phase 3: Performance of an Integrated Safety Assessment.

The purpose and the elements of each of the three phases are summarized in the RFP SEP Management Plan.

Phase 1 was conducted from approximately April 1990 through April 1992. The tasks performed during this period consisted not only of those specified in the Phase 1 Plan such as a Topics List and Topic Evaluation Plans, but also included, in collaboration with DOE, the development of the SEP concept, approach, and process. These efforts resulted in the development of the DOE Management Plan for the implementation of DNFSB Recommendation 90-5 and the development of the RFP SEP Management Plan, Quality Assurance Plan, Phase 1 and Phase 2 Plans, and several programmatic working procedures for RFP to conduct the SEP.

In Phase 1, sixteen topics were selected as an organizational mechanism to evaluate structures, systems, and components. The topics included initiating events, such as natural phenomena hazards, and systems topics. The topics are as follows:

- Wind and Tornado
- Seismic
- Hydrology
- Other External Events
- Fire Protection Systems
- Electrical Power Supply Systems
- Instrumentation and Control Systems
- Nuclear Criticality Design
- Environmental Qualification
- Confinement Barrier System
- Hazardous Material Control
- Confinement Ventilation System
- Other Internal Events
- Utility Systems
- Human Factors
- Classification of Structures, Systems and Components

Generic Topic Evaluation Plans (TEP) were developed for each topic. The TEPs identified current design requirements, acceptance criteria, and described a plan for evaluation. The TEPs were generic rather than building-specific. Identification of building specific structures, systems and components, their associated safety functions and development of specific current design requirements and acceptance criteria will be performed in Phase 2.

Phase 2 work began in approximately April 1992 on Building 559. DOE subsequently directed EG&G to stop work on Building 559 and commence Phase 2 work on Building 707. Data collection and review of this data has been completed for the majority topics expected to be evaluated on Building 707. This data includes drawings, design specifications, and previous studies and analyses. The SEP review and assessment of existing studies at RFP is being documented in twelve special study reports. These reports are in the areas of seismic, fire protection, electrical, I&C, confinement ventilation systems, and confinement zones.

Seismic Hazards Study

To support the seismic analysis of buildings and components, SEP has undertaken a comprehensive study, using recognized seismic experts to establish the appropriate seismic hazard for RFP.

Current estimated progress is indicated below:

Task Description

- 1 Definition of Seismic Hazard Issues**
- 2 Preliminary Seismic Hazard Evaluation**
- 3 Soil Amplification Studies**
The purpose of Task 3 is to determine the effects of the alluvial soil overlying site bedrock on ground motion at plant structures. The 2-D amplification analysis was finalized, but the task will not be completed until results are available from the shear wave velocity testing.
- 4 Vibratory Ground Motion**
The purpose of Task 4 is to determine methods suitable for use at the Rocky Flats Plant (RFP) site to translate earthquake motions from distant events to ground motion at the site. Since there were no empirical attenuation relationships available for this region, studies from other regions were adapted and modified. The draft task report presented two methods for attenuation-distance relationships, one empirical and the other analytical. By utilizing both methods in the seismic hazard assessment, there will be a comprehensive and bounding set of assumptions for calculating seismic hazard and quantifying uncertainties.
- 5 Soils Liquefaction Potential**
The purpose of Task 5 is to assess the potential for earthquake induced liquefaction of the soils at the RFP site. In large earthquakes, loose sandy soils in combination with ground water can liquify, causing severe problems with foundations of structures. The draft task report concluded that, based on the available data, there was no significant liquefaction potential at RFP. The conclusion was in agreement with previous studies.

6 Stability of Geotechnical Structures

The purpose of Task 6 is to review the stability of earth slopes at the site during earthquake induced ground motion. The draft report concluded that while permanent deformations of the existing earth slopes at the site were generally negligible, if the results of the overall study concluded there was a potential for significant ground motion and a slope could severely impact a plant structure, a more detailed study of the slope in question might be required.

7 Detailed Seismic Source Characterization

The purpose of Task 7 is to further investigate the issues identified in the Task 2 preliminary study. Task 2 identified potentially important source characterization issues worthy of further studies. The draft report presented the sources identified and a discussion of the parameters and associated uncertainties. The terms of magnitude, distance, and recurrence interval with probabilities identified for ranges of parameters. These sources will be combined with the results from the other tasks to determine the seismic hazards for the site.

8 Historical Seismicity Studies

9 Draft Seismic Hazard Recommendation

10 Final Seismic Hazard Recommendation

11 Artificial Ground Motions

Tasks 1 and 2 are complete; Tasks 4 through 7 have been completed in draft form.

Approval was obtained from DOE-RFO to proceed with shear wave investigation efforts (an input to the Soil Amplification Study, Task 3 above), and the associated drilling program.

Management Issues

Seismic Hazard Study

Performing natural phenomena evaluations at Rocky Flats presents unique management issues in the areas of environmental, quality assurance, procurement, building access, and coordination with other site programs and organizations.

All soil at Rocky Flats Plant is treated as potentially contaminated, either radiologically or toxicologically. As a result, commitments to the Colorado Department of Health (CDH) and the Environmental Protection Agency (EPA) require testing of all removed soil. Because of testing constraints, all removed soil must be containerized prior to testing. As part of the Seismic Hazard Study, it was necessary to perform shear wave testing which required eight four inch diameter boreholes ranging

from 50 feet to 500 feet in depth to be drilled. Consistent with RFP commitments to the CDH and EPA, the soil removed during drilling was required to be containerized and tested. To accomplish this, it was necessary to purchase 100 55-gallon barrels which were required to meet Department of Transportation Standard DOT-17C. Arrangements also had to be made to test the soil for contamination. Because of the potentially contaminated nature of the soil, it was necessary to take precautionary measures and utilize a health physics technician at the drilling site. In determining borehole locations, it was necessary to assure that there were no underground interferences which required approvals from various RFP organizations and, for security reasons, security approval was also necessary. To minimize cost, the drilling performed for the Seismic Hazard Study was coordinated with drilling being performed by the Environmental Restoration Management Group at RFP. This coordination required additional up front planning for approximately four weeks; however, it resulted in fewer total boreholes than if the up front coordination did not occur. The cost to purchase barrels and test soil was approximately \$200,000; the cost to perform shear wave testing was approximately \$40,000.

Much of the work being performed for the Seismic Hazard Study is being performed by EG&G subcontractors. For example, separate subcontracts were awarded to perform the drilling, the shearwave testing, barrel purchase, and soil testing. All subcontracts must conform to DOE regulations concerning subcontracts which is a time consuming process. The process requires issuing requests for proposal, technical and financial evaluation of the proposals, and awarding the contract.

Quality Assurance

Quality Assurance (QA) at RFP requires full compliance with Section 8 of ASME NQA-1. This encompasses building model and software development, data, and evaluations. RFP was built in the early 1950s with subsequent additions and modifications. Because of the plant's age, structural properties and as-built configurations have not always been well documented over the years. This requires a justification and recreation of the necessary information in order to perform the SEP analyses. In-situ material testing is likely to be necessary in some cases to determine material properties. To accurately reflect as-built conditions, walkdowns of structures and equipment are required, some of which have been performed. To assist in developing QA approved data and evaluations, the following procedures were written as part of SEP:

- SEP-08 Software Quality Assurance
- SEP-203 Documents and Data Validation
- SEP-205 SEP Configuration Walkdown Procedure for Structures
- SEP-206 General Walkdown Procedure
- SEP-210 Walkdown Procedure for Screening and Evaluation of Systems and Components using Experience Data

Summary

In summary, environmental, quality assurance, procurement, and coordination requirements at Rocky Flats have presented unique challenges to managing the SEP natural phenomena evaluations. The requirements have added cost and extended the SEP completion schedule. However, by focusing management attention on these issues and through advance planning, cost and schedule impacts can be minimized.

SYSTEMATIC EVALUATION PROGRAM (SEP) AT ROCKY FLATS PLANT:

AN OVERVIEW OF PRACTICAL MANAGEMENT

ISSUES FOR EVALUATION OF NATURAL PHENOMENA HAZARDS

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October 19, 1993**

REVIEWED FOR CLASSIFICATION

By

William D. [Signature]

Date

7-29-93

Purpose of SEP

- To systematically assess the safety significance of differences between RF facility designs and more modern standards to ensure that a balanced and integrated level of safety is achieved for long-term operations.

SEP Objectives

- **Select safety significant topics for evaluation.**
- **Determine current design requirements.**
- **Determine acceptance criteria based on design safety function.**
- **Evaluate how as-built structures, systems, and components compare to acceptance criteria.**
- **Conduct integrated safety assessment and recommend a set of integrated plant design improvements.**

SEP Basis

- **DNSFB Recommendation 90-05: Develop and implement a SEP**
- **Public Law 102-190, 105**
- **DOE SEP Implementation Plan**
- **EG&G committed in the Operational Improvements Plan (OI) to perform an SEP at RF**
- **SEP is tied to resumption program which requires that:**
 - **A formal SEP is being initiated**
 - **Adequate resources/budget are allocated to allow progress on schedule**
- **DOE recommitted to implement SEP in a letter from Secretary of Energy to the DNFSB dated June 25, 1993**

Scope of SEP

- **Primary emphasis on assessing safety of Structures, Systems, and Components (SSCs) associated with accident prevention and mitigation relative to public health and safety risks**
- **Secondary emphasis on occupational hazards (worker safety)**
- **Early identification and timely resolution of significant safety deficiencies of immediate concern**

SEP Approach

- **Phase 1 - Topic Selection and Development of Topic Evaluation Plans**
- **Phase 2 - Evaluation of Topics**
- **Phase 3 - Integrated Assessment**
- **Phase 4 - Implementation of Phase 3 recommendations**
(not within scope of SEP)

Phase 1

- **Selection of Topics for SEP Review (Topics List)**
- **Develop a Topic Evaluation Plan for each Topic**
 - **Development of Safety Objectives ,Safety Functions**
 - **Identification of Current Design Requirements (CDRs)**
 - **Development of Acceptance Criteria (ACs)**
 - **Development of Evaluation Methodology**

Phase 2

- **Identification of Safety Significant SSCs Relevant to Topic**
- **Topic Evaluation**
 - **Evaluate SSCs against criteria**
 - **(CDRs/ACs) in TEPs**
 - **Identify significant safety deficiencies of Immediate Safety Concern**
 - **Identify low-cost remedial actions**

Phase 3

- **Integrated Assessment**
 - **Safety Significance/Risk Reduction**
 - **Cost/Benefit**
 - **DOE Backfit Policy**
 - **RFP Mission Change**
 - **Building/Site**
- **Recommend Integrated Actions**

SEP Topics

- **Wind and Tornado**
- **Seismic**
- **Hydrology**
- **Other External Events**
- **Fire Protection Systems**
- **Electrical Power Supply Systems**
- **Instrumentation and Control Systems**
- **Nuclear Criticality Design**
- **Environmental Qualifications**
- **Confinement Barrier Systems**
- **Hazardous Material Control**
- **Confinement Ventilation System**
- **Other Internal Events**
- **Utility Systems**
- **Human Factors Engineering**
- **Classification of SSCs**

SEISMIC HAZARD STUDY (SHS)

- **Site-wide applicability**
- **Develop site-specific response spectra**
- **Consists of 11 Tasks**
 - **Definition of Seismic Hazard Issues**
 - **Preliminary Seismic Hazard Evaluation**
 - **Soil Amplification Studies**
 - **Vibratory Ground Motion**
 - **Soil Liquefaction Potential**
 - **Stability of Geotechnical structures**
 - **Detailed Seismic Source Characterization**
 - **Historical Seismicity Studies**
 - **Draft Seismic Hazard Recommendation**
 - **Final Seismic Hazard Recommendation**
 - **Artificial Ground Motions**
- **Necessary to drill boreholes to perform shearwave testing as input to Task 3**
- **Expected completion in Fall, 1993**

MANAGEMENT ISSUES

- **Environmental**
- **Quality Assurance**
- **Procurement**
- **Coordination with other Site Programs and Organizations**

BOREHOLE DRILLING FOR SEISMIC HAZARD STUDY

- **Drilling to perform shearwave testing to support Seismic Hazard Study**
- **All soil onsite potentially contaminated**
- **Commitments to Colorado Department of Health and Environmental Protection Agency require containerizing and testing removed soil**
- **Necessary to purchase 100-55 gallon barrels to containerize soil**
 - **Barrels required to meet Department of Transportation standard DOT-17C**
- **Borehole locations required approval for underground interferences and security**

BOREHOLE DRILLING FOR SEISMIC HAZARD STUDY

- SHS Drilling coordinated with drilling being performed for site Environmental Restoration Management
- Necessary to issue requests for proposal for borehole drilling and for shearwave testing and evaluate respondents in accordance with government procurement regulations
- Shearwave testing equipment calibration - NCR issued
- Cost to purchase barrels and test soil: \$200,000
- Cost to perform shearwave testing: \$40,000
- Coordination and approval by other site organizations added approximately 4 weeks to schedule

QUALITY ASSURANCE

- **Quality Assurance (QA) at RFP requires full compliance with ASME NQA-1**
- **SHS model and software development must meet NQA-1**
- **Data and evaluations developed previously did not meet NQA-1**
- **Structural properties not always well documented**
- **Drawings do not always reflect as-built due to previous lack of a Configuration Control Program**

QUALITY ASSURANCE

- **Developed procedures to address these shortcomings**
 - **SEP-08 Software Quality Assurance**
 - **SEP-203 Documents and Data Validation**
 - **SEP-205 SEP Configuration Walkdown Procedure for Structures**
 - **SEP-206 General Walkdown Procedure**
 - **SEP-210 Walkdown Procedure for Screening and Evaluation of Systems and Components using Experience Data**
- **Walkdowns necessary before beginning analyses**
- **In-situ testing may be necessary**
- **Approximate cost to meet QA requirements: \$200,000**

**DATE
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