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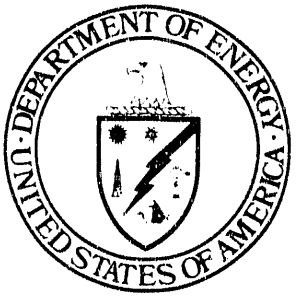

Technical Safety Appraisal of the Lawrence Livermore National Laboratory

December 1990

MASTER

TECHNICAL SAFETY APPRAISAL

LAWRENCE LIVERMORE NATIONAL LABORATORY

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ACRONYMS

The following acronyms are used throughout this report.

ACGIH	American Conference of Governmental Industrial Hygienists
AD	Associate Director
ALARA	As Low As Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
ARAC	Air Release Advisory Capability
ATA	Advanced Test Reactor
ASME	American Society of Mechanical Engineers
AVLIS	Atomic Vapor Laser Isotope Separation
Be	Beryllium
BSS	Building Safety Systems
CAM	Continuous Air Monitor
CAR	Corrective Action Reporting
DAP	Discipline Action Plan
DOE	Department of Energy
DOELAP	DOE Laboratory Accreditation Program
DOL	U.S. Department of Labor
DOP	Dioctylphthalate
DOT	U.S. Department of Transportation
EAL	Emergency Action Level
EAP	Employee Assistant Program
EDD	Employee Development System
EDS	Engineering Demonstration System
EMT	Emergency Medical Technician

ACRONYMS (Cont'd)

EOC	Emergency Operation Center
EPA	U.S. Environmental Protection Agency
EP	Emergency Planning
EPIP	Emergency Plan Implementing PRocedures
ES&H	Environment, Safety, and Health
FMRC	Factory Mutual Research Corporation
FSAR	Final Safety Analysis Report
FSP	Facility Safety Procedure
FTE	Full-Time Employee
FY	Fiscal Year
GFCI	Ground Fault Circuit Interrupter
HCD	Hazards Control Department
HE	High Explosives
HEAF	High Explosives Application Facility
HEPA	High-Efficiency Particulate Air
HESQA	Health, Environment, Safety and Quality Assurance
HETB	Hardened Engineering Test Building
HIRAC	Hazardous Information Record and Control
HSM	Health and Safety Manual
HST	Health and Safety Technicians
HWMD	Hazardous Waste Management Division
IEEE	Institute of Electrical and Electronic Engineers
IH	Industrial Hygienist
LDF	Laser Demonstration Facility

ACRONYMS (Cont'd)

LEDO	Laboratory Emergency Duty Officer
MD	Management Directive
MDA	Minimum Detectable Activity
MDD	Materials Distribution Division
MICN	Mobile Intensive Care Nurse
MMD	Materials Management Division
MOCVD	Metal Oxide Chemical Vapor Deposition
MSDS	Material Safety Data Sheets
NCR	Nonconformance Reporting
NDE	Nondestructive Evaluation
NFPA	National Fire Protection Association
NQA	Nuclear Quality Assurance
NRC	Nuclear Regulatory Commission
OJT	On-the-job Training
ORR	Operational Readiness Review
OS	Occupational Safety
OSHA	U.S. Occupational Safety and Health Administration
OSP	Operational Safety Procedure
OSR	Operational Safety Requirement
PA	Public Address
PFD	Protective Force Division
PT	Packaging and Transportation
Pu	Plutonium
QA	Quality Assurance

ACRONYMS (Cont'd)

QAM	Quality Assurance Manual
QAO	Quality Assurance Office
QAP	Quality Assurance Plan
QC	Quality Control
RWP	Radiation Work Permit
SA	Safety Appraisal
SAD	Safety Analysis Document
SAG	Safety Analysis Guide
SAN	U.S. DOE San Francisco Operations Office
SAR	Safety Analysis Report
SCBA	Self-contained Breathing Apparatus
SILAS	Secure Interactive Livermore Alarm System
SIS-EDS	Special Isotope Separation Engineering Demonstration System
SOP	Standard Operating Procedures
SRC	Safety Review Committee
TAP	Training Accreditation Program
TRU	Transuranic
TSA	Technical Safety Appraisal
UC	University of California
UL	Underwriters Laboratories
UOR	Unusual Occurrence Report

I. INTRODUCTION

This report documents the results of the of Technical Safety Appraisal (TSA) of the Lawrence Livermore National Laboratory (LLNL) (including the Site 300 area), Livermore, California, conducted from February 26 to April 5, 1990. The purpose of the assessment was to provide the Secretary of Energy with the status of Environment, Safety and Health (ES&H) Programs at LLNL. LLNL is operated by the University of California for the Department of Energy (DOE), and is a multi-program, mission-oriented institution engaged in fundamental and applied research programs that require a multidisciplinary approach.

Founded as a nuclear weapons design laboratory in 1952, LLNL was officially established as the Lawrence Radiation Laboratory, the Nation's second laboratory dedicated to nuclear weapons research and development. It has been operated by UC ever since - for the Atomic Energy Commission until 1975, then for the Energy Research and Development Administration (ERDA) until 1977, and now for DOE. LLNL is now a multi-program, mission-oriented institution engaged in abstract and applied research programs that require a multidisciplinary approach.

Major programs include: research, development, and test activities associated with the nuclear design aspects of the nuclear weapons life cycle and related national security tasks; inertial confinement fusion; magnetic fusion energy; biomedical and environmental research; laser isotope separation; energy-related research; beam research physics; and support to a variety of programs for the Department of Defense and other Federal agencies. Site 300 supports LLNL's primary mission in the design of nuclear weapons through facilities that allow multiple, simultaneous diagnostics capability for hydrodynamic testing. Site 300 provides the ability to develop new high explosives or fabricate any high explosives from raw materials, the ability to manufacture and assemble parts for testing, test facilities for destructive and non-destructive testing, support for projects using high explosives, diagnostics, and the capability to perform particle beam research.

LLNL is located on an 821-acre site, at the eastern end of Livermore Valley in southeastern Alameda County, California, approximately 50 miles southeast of San Francisco. (See Figure 1-1.) The Livermore Valley is the eastern part of a valley system lying south of Mt. Diablo and east of the hills surrounding San Francisco Bay. Farther to the east, another low range of hills separates the Livermore Valley from the San Joaquin Valley of central California. To the north rise the higher hills of the Diablo Range, a sparsely settled region of forest, chaparral, and rangeland. The hills around the Livermore Valley are for the most part covered with grasses. Agriculture remains the major land use east of LLNL, but land to the north is being developed for light industrial uses. To the west, agricultural land is being developed - with land sales, subdivisions, and annexations by the city of Livermore increasingly common. On its southern perimeter, LLNL shares East Avenue with Sandia National Laboratories, with which it also shares facilities such as fire protection, a cafeteria, parking lots, and utilities.

Site 300, which is considered to be part of LLNL, comprises 11 square miles, located in both Alameda and San Joaquin counties, about 18 miles east of the LLNL main site. It was established as a remote explosives facility to support theoretical and developmental work performed at the LLNL main site. Site 300 is used primarily for high explosive testing, although assembly testing and particle beam research is also accomplished there. Portions of Site 300 used for support services include the firing and test areas, chemistry and process areas, and the general administration and support areas.

The area surrounding Site 300 is sparsely populated, with the majority of the land used to support sheep and cattle ranching operations.

The TSA was conducted by a team consisting of professionals from DOE, contractors, and consultants. The Team found a significant number of ES&H concerns, which are included in the report, that require prompt management attention. Although LLNL management subscribes to the recent Secretarial ES&H initiatives and acknowledges the imperative for action, a significant change in culture will be required before LLNL can attain consistent and verifiable compliance with statutes, regulations, and DOE Orders.

Safety activities at the LLNL are informal, fragmented, and inconsistently implemented. In general, there is no comprehensive sitewide strategy and coordinated direction for ES&H programs. However, compliance issues identified by The Team are known to Federal, State, and local permitting agencies.

TSAs are operationally focused evaluations. As such, a TSA appraises how safely a facility or site is being operated and the condition of its equipment. The design of a facility and its systems to permit safe operation is presumed by the TSA process to be adequate. This TSA addresses whether the facility design and current operations are consistent with the safety documentation, whether that documentation is adequate, and whether the current operations are being conducted within the OSRs established for the facility.

The Appraisal Team's efforts were guided by a set of preestablished Performance Objectives with supporting Criteria. The draft document, "Performance Objectives and Criteria for Technical Safety Appraisals (Non-Nuclear)," dated October 1989, was used to perform the TSA.

Where the site or facility performance has not met the Performance Objective, a Concern is developed which indicates the weakness or noncompliance. This Concern is then supported by one or more Findings of Fact. This report contains the more significant Findings of Fact that support the Concerns identified by the TSA Team. In cases, Findings supporting a Concern can also be found under other Performance Objectives. When this is the case, cross-references have been provided to the applicable Concern. The Concerns identified by the Aporaisal Team are located under the Performance Objectives that are most relevant to the Concerns.

A Concern addresses a situation that in the judgment of the Appraisal Team: (1) reflected less than full compliance with a DOE safety and health requirement or mandatory safety standard; (2) threatened to compromise safe

operation; or (3) if properly addressed, would substantially enhance the excellence of that particular situation even though that part of the operation was judged to have a currently acceptable margin of safety. Because of this last category for addressing the excellence of the operation, more Concerns are reported than would result from a strictly compliance-oriented appraisal.

In addition to identifying Concerns, the Appraisal Team looked for exceptional practices in accomplishing Performance Objectives. These exceptional practices are contained in the Section under Noteworthy Practices.

This appraisal is an evaluation at a fixed point in time. As a result, improvements to safety that have been planned, but are not yet completed, are identified as Concerns if the Appraisal Team judged that failure to complete the improvements would significantly impact the safety of facility operations.

The Appraisal Team was guided by Mr. O. D. T. Lynch, Jr., Director of the DOE Division of Safety Inspections. Mr. Fredric D. Anderson and Mr. Richard H. Lasky of the DOE Office of Safety Appraisals were the Team Leaders. The Appraisal Teams consisted of technical experts, including DOE employees, DOE contractors, and outside consultants. The members of the Appraisal Team and their areas of principal assignment are listed in Appendix C. A biographical sketch of each of the Appraisal Team members is included in Appendix D.

The Appraisal Teams wish to express appreciation for the excellent cooperation exhibited by all levels of LLNL management and staff and for the hospitality and support of DOE-SAN.

II. PERFORMANCE EVALUATION

LLNL uses matrix management to provide flexible and prompt marshalling of resources in response to changing priorities or missions and to address new or unusual problems. This mechanism, like LLNL's health and safety program, has its strengths and weaknesses. While effective in promoting the basic research mission of LLNL, for a facility as large and complex as LLNL has become, the matrix system has inherent shortcomings that have resulted in the diffusion of safety responsibility and authority and blurring of its lines of communication. This diffusion is a key contributor toward the shortcomings identified in the health and safety performance of the LLNL.

Multiple lines of responsibility exist, along programmatic, administrative, or support lines, and combinations of these. While individuals indicate some comfort in working in a matrix system, the line of safety responsibility upward from individual workers is inconsistent or ambiguous, being perceived to follow all three lines. Overlaps in authority and responsibility exist, as well as duplication of resources, and even some level of interference and absence of cross communication, as exemplified by the three divisions sharing responsibility for hazardous materials packaging and transportation activities, duplicating some resources and, historically, not communicating with each other.

While ultimate responsibility for safety rests with the LLNL Director at the top, and knowledgeable, well-motivated and safety-conscious individual workers at the bottom, implementation of LLNL's safety program in the interposition is accomplished through both multitiered and multipathed, unique combinations of senior management positions, safety review committees, safety teams, site/facility and program managers and supervisors, and division-level safety function organizations. Most key safety positions are identified, but not all are without some ambiguity, and some are without sufficient resources.

Senior management promotes safety, but is not following through to ensure implementation and is not perceived as being sufficiently present at work sites -- the lack of, or infrequent presence of upper management at Site 300 has distanced the site's staff in their perception of support and opportunity from the main site organizations.

Many aspects of the safety program are fragmented, unfocused, inconsistent, not in compliance, and proper priorities are not being established. Safety reviews are often conducted in a support role, rather than as oversight, by safety teams and committees which depend on the programs for funding. LLNL does not have a program to conduct independent self-assessments. Safety reviews are encouraged at many levels through committees, but these groups are generally involved only in issues and subjects brought to them for review by proponents of research programs. Thus, the performance of safety reviews and oversight at LLNL has an inherent aspect of conflict of interest.

Several examples of failure to fully comply with DOE Orders and Federal regulations with respect to public and occupational safety were identified, including packaging and transportation activities, fire alarm and life safety code violations, OSHA noncompliances in construction and operations, and electrical code violations. There is no program to identify equipment important to safety, and events significant to safety have existed without being reported, documented, or evaluated, and without benefit of lessons

learned. Critical components of fire protection systems are nonfunctional during the cold months of the year, some valves are inaccessible, and the condition of water mains because of corrosion, neglect, and lack of monitoring have rendered substantial portions of the Site 300 fire protection system unreliable. Greater attention should be given to maintenance of safety-related systems.

Safety documentation quality is spotty, not generally complete, current, accurate or accessible. Most facilities do not have approved or in-place Safety Analysis Reports or Operational Safety Requirements. Safety-related procedures vary in quality and approach and adequacy, depending on the program and level of generation. There is no function at LLNL that tracks status and needs for safety documents on a sitewide basis.

The safety function organizations are staffed by competent safety professionals, but LLNL has not devoted sufficient resources to non-research-related health and safety activities. Although the level of technical competence is very high at LLNL, no policy or procedures manual nor corporate standard exist for training. Considerable variability exists in training activities and administration. Training evaluation techniques and methods vary widely and in many cases do not exist. The quality of training documentation is also variable, good in some facilities such as the Plutonium Facility and Hazards Control; poor in others, such as the Security Protection Force. Hazards communications need to be more consistent and effective.

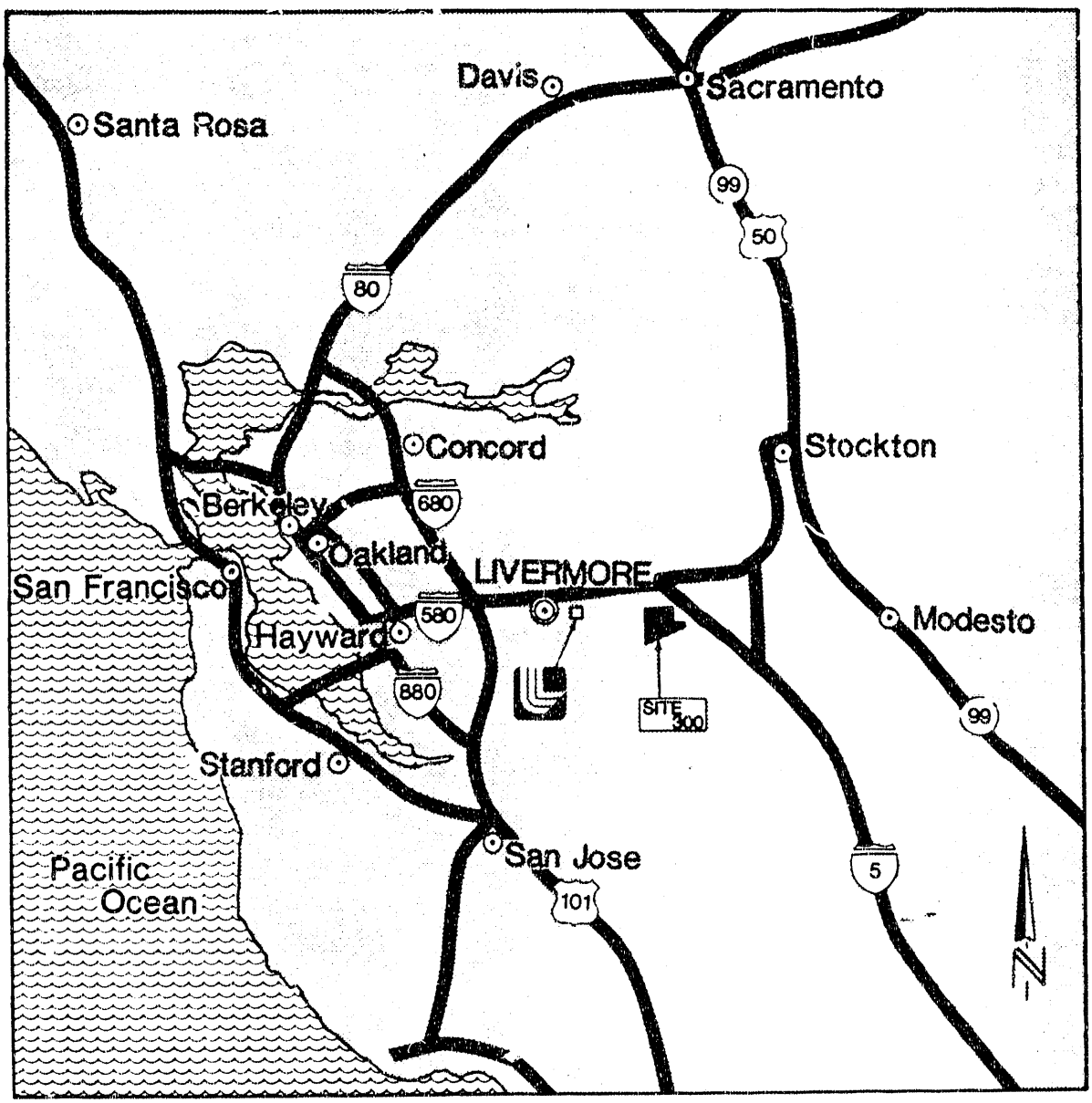
The Whiz Tag System, intended to provide rapid response to high-priority maintenance needs, is one of several mechanisms available which allow modifications and installation of new equipment without benefit of mandatory review or documentation by fire protection, Hazards Control, or security. Quality verification is inconsistent and ineffective; there is no sitewide instrument/gauge/tool calibration program.

Strengths exist in technical competence, criticality safety, medical services, laser safety, training programs provided by the Hazards Control Department, and emergency response capability (although planning in this area is deficient, and training is in the early stages of development and not yet implemented).

Five root causes may be identified for the deficiencies in LLNL safety performance: (1) DOE SAN and LLNL management have not established controls that are effective in verifying compliance with safety procedures and requirements; (2) weaknesses in training and a lack of formality in safety-related operations have resulted in widespread noncompliance; (3) senior management involvement and independent verification of adequate safety is lacking, in that there is a need for proactive searches for safety-related deficiencies and improvements, and there are no consistent searches for potential safety degradation, feedback from quality assurance activities, lessons learned from onsite and offsite operating experience, or meaningful consideration of advances in safety technology; (4) DOE SAN has not exercised close safety oversight of LLNL, although there is evidence of occasional involvement by DOE SAN in safety issues at LLNL and a small presence on site, but frequent inspections, assessments, and followups required to ensure that

an appropriate level of safety performance is achieved are absent; and (5) there is an expectation and assumption of safety rather than an inquisitiveness to challenge a suspect assessment or demonstrate its safety. The dedicated and highly competent staff at LLNL is capable of substantially improving overall safety performance. This improvement can be realized through proactive management control of safety analyses, procedures, training, maintenance, and operations, and can be demonstrated through better workplace practices and documentation.

LLNL Location



III. FINDINGS AND CONCERNS

All of the areas that were appraised at the LLNL are discussed in this section. The summary statement for each area addresses the more pertinent facts obtained and conclusions drawn from: (1) observing routine operations, emergency exercises, and the physical condition of the facilities; (2) talking with LLNL management, technical, and craft personnel; and (3) reviewing policy statements, records, procedures, and other documents.

All Performance Objectives for which Findings leading to a Concern were identified by the Appraisal Team are given in this section. The findings that follow the statement of each applicable Performance Objective address the more pertinent facts obtained that led to the stated Concern. All Concerns with LLNL are identified in this section. Addressing these Concerns with appropriate corrective actions will improve the level of safety of the operations at this site. Each Concern has been classified as to its seriousness in accordance with the system described in Appendix A. The results are summarized in Appendix B. The Findings that serve as the basis for a Concern can be found immediately preceding the Concern and are identified by the use of an asterisk (*). ToO understand the full intent of any Concern, it is necessary to read its basis. The resolution of the individual Concerns may not be sufficient to prevent their recurrence. Therefore, the underlying issues or root causes also need to be sought out and addressed.

The program activities evaluated were, generally, found to be conducted in accordance with acceptable operating procedures. However, instances were found where compliance with some aspect of a DOE-mandated requirement is deficient or could be improved, or where a greater level of safety is needed to be attained through strict adherence to existing procedures. Other instances were identified where procedural improvements were required.

The Appraisal Team realized that most of its negative Findings are only symptomatic of underlying casual factors. The Appraisal Team has made an effort, drawing upon the extensive relevant experience of its members, to identify the underlying causal factors in developing its summary statements.

However, the Appraisal Team recognizes that this effort is imperfect at best because of the limited time the team could devote to analyzing the problems, and the team's relative unfamiliarity with the details of the contractor's overall operation. Therefore, the Appraisal Team believes that the contractor should consider the Findings, and even the statements of Concern, as possibly symptomatic of some set of deeper root causes, and should search out and correct root causes so that there will be reasonable assurance that improvements in the safety of the operation will be sustainable.

Of the 142 Concerns, all are Category III, with the exception of 5 that are judged to be Category II. Category II Concerns are defined as having a hazard significance and urgency such that the necessary response should be addressed shortly following the closeout of the appraisal. Category III Concerns are expected to be addressed in a normal, responsive manner. The criteria for a Category II Concern states that "...consideration should be given to whether facility shutdown is warranted under the circumstances." The Appraisal Team considered this issue and judged that facility shutdown was <u>not</u> warranted based upon any individual Concern or the collective impact of all the Concerns.

A. ORGANIZATION AND ADMINISTRATION

This Appraisal addressed all eight Performance Objectives in the Organization and Administration area. The Organization and Administration review of LLNL was accomplished by interviewing selected LLNL management personnel, including the Director and Associate Directors, the Resident Manager, Department/ Division Managers at the main site, representatives at Site 300 who have been designated to serve as members of the Resident Manager's staff, and selected technicians; by reviewing documents; by visiting facilities at both the LLNL main site and at Site 300; by viewing actual operations in the Dissolving Wing of Bldg. 151; and by attending presentations by LLNL and DOE SAN management staff.

LLNL is a large organization with a broad spectrum of activities. Responsibility for safety is delegated downward from the LLNL Director through program support and administrative paths. Matrix assignments of individuals at lower management, supervision, and work force levels result in a lack of clarity in accountability for safety. To ensure accountability, management functions must be defined and integrated sitewide, and ground rules must be documented for conducting day-to-day business in a consistent way throughout LLNL.

As a consequence of the matrix management system used by LLNL, some organization charts show the administrative line of responsibility; others the programmatic line of responsibility; and still others the Site 300 reporting line, which is neither administrative nor programmatic. Thus, most management personnel and staff have two reporting lines, while many of those at Site 300 have three.

Some management personnel and staff interviewed thought that safety responsibility followed the administrative line, while others thought it followed the programmatic line. At Site 300, because the safety responsibility is assigned to the Resident Manager, the line safety responsibility is not a single unbroken line but a dual line that comes together at varying levels of LLNL management.

Even though the matrix organization is difficult to understand, most of those interviewed felt comfortable working in this type of organization. However, a few employees indicated that multiple lines of safety responsibility can lead, and have led, to situations in which they have felt pressured to relax safety requirements in the interests of program objectives. Potential conflicts between program and safety interests can occur because safety team members provide both safety overview and technical assistance to programs. In addition, program managers must decide on the funding level for safety in competition with program funds. A means of ensuring that funding reflects safety priority has not been established. These potential conflicts are not addressed by sitewide management procedures. The matrix system inherently complicates the establishment and maintenance of safety accountability at LLNL.

The Resident Manager has been assigned responsibility for establishment and operation of the safety program at Site 300. However, he has not been delegated sufficient direct authority or resources to fulfill this responsibility. Furthermore, the Site 300 Safety and Operational Manual states that operational safety lies with the department/division operating the

facility involved; the safety responsibility for technical support lies with the department/division performing the work; and the Resident Manager has the staff safety support responsibility.

The LLNL is an informal organization. Mission and function statements, which define the assigned purpose of each organizational unit and how this purpose is to be accomplished, do not exist for all organizational units. The mission and function statements that do exist are located in various types of documents. There are no written and promulgated sitewide safety goals that can be tracked to determine success or failure, nor do all departments/ divisions have written safety goals. Specific position/job descriptions that delineate safety responsibilities do not exist for all management personnel.

LLNL Management's assessment of facility activities is compromised by the lack of a sitewide program for ensuring performance quality through frequent, formal audits; neglecting to make full use of the unusual occurrence reporting system; and lack of a sitewide data analysis and trending requirement. In addition, information being provided to employees in the form of manuals and safety procedures lacks clarity, completeness and accuracy, making good worker performance difficult to achieve and measure.

The LLNL Health and Safety Manual and the Site 300 Safety and Operational Manual are not controlled. Safety analysis documentation is not satisfactory in format or content. LLNL is quite familiar with the extensive deficiencies in Safety Analysis documentation at LLNL.

The Site 300 personnel form a close-knit group. They are proud of their accomplishments and firmly believe that the Site 300 level of safety far exceeds that at the LLNL main site. The management personnel and staff interviewed were knowledgeable of their own assignments, as well as the overall operation of Site 300. There appeared to be greater loyalty to Site 300 than to LLNL. Many Site 300 management personnel and staff feel somewhat isolated at Site 300 and, because of the infrequent visits to Site 300 by upper-level LLNL management personnel, they do not believe they can compete on an equal basis with LLNL main site organizations for staffing and other resources.

Personnel management is performed in accordance with a sitewide guide, implemented at the Associate Directorate level. The absence of administrative requirements leads to considerable variability in practices. Performance appraisal is used not only to measure the employee's performance, but also to establish his or her scope of work. Performance appraisal objectives tend to be general and often inadequate in their consideration of safety performance.

The LLNL fitness-for-duty program does not include subcontractors and visitors, nor is there sufficient preassignment testing of employees in sensitive positions for substance abuse or preemployment and random testing.

There are more than 40 concerns in the report which have been categorized as deficiencies in which LLNL is not in compliance with DOE Orders. LLNL has no systematic means of ensuring that DOE Orders are being followed in the relevant activities.

OA.1 SITE/FACILITY ORGANIZATION

PERFORMANCE OBJECTIVE: Management should organize and manage the site/facility's work, programs, and resources so that safety and health are an integral part of the personnel duties and requirements are consistently implemented.

FINDINGS:

- o An overall management plan which would define the LLNL mission, the scopes of work for the numerous Associate Directors, priorities, objectives, responsibilities, and interfaces which would also include safety considerations has not been developed and put in place at LLNL.

- o Some of the above matters are discussed and resolved through reviews by a complex array of upper-level management committees; however, clear accountability for responsibilities and functions is difficult to verify through this review process. A document was provided which lists the committees, their general scopes of activity, membership, and reporting line. The document does not address how this arrangement of committees would be integrated to perform the management plan functions enumerated above.

- o The Director of LLNL has initiated an effort through an exchange of letters between the Director and the Associate Directors to establish agreed-upon roles for upper management; however, this effort, originally undertaken in mid-1989, is incomplete.

- o The above letters indicate that there are a number of deficiencies related to the definition of organizational functions and responsibilities at LLNL, such as problems with an Associate Director modifying top-level directives, clarity of delegation of authority, lack of a strategic plan, and lack of initiatives for the Associate Directors to work together.

- o A sitewide administrative plan to establish a consistent set of requirements has not been implemented, resulting in excessive inconsistency in the conduct of operations related to safety overview, auditing, training, operation, procedures, document control, and personnel management.

- o See Sections MA.2, PT.1, AX.3, TC.1, and OP.1; and Concerns RP.1-2, SS.3-1, and MA.1-5.

CONCERN: (OA.1-1) (H3/C2) Accountability for safety responsibility is not clearly defined because of the lack of upper-level management control documentation.

FINDINGS:

- o Safety is clearly stated at LLNL to be a line responsibility; however, the matrix management tends to obscure the understanding of individuals at the matrix intersections as to which line, administrative or functional, is correct for them.

- o Working-level staff can experience undue pressures in situations where program objectives are in conflict with safety requirements; perceived threats of retaliation by, for example,

withdrawal of program support for a matrixed individual who strictly enforces safety requirements can discourage reporting of potential safety problems.

- o Hazards Control Safety Team personnel are subject to a conflict of interest because their fiscal support comes from the program organization for whose activities they are providing safety overview.

- o It is understood from management-level interviews that the question of clear lines of safety responsibility is a matter of concern at LLNL recently and has been addressed but not fully communicated to the working level.

- o See Section PT.1.

CONCERN: (OA.1-2) (H2/C2) LLNL has failed to maintain clear lines of safety responsibility and independence of safety overview.

FINDINGS:

- o All working-level staff interviewed stated that their line safety responsibility was to their immediate supervisor, regardless of whether that was the administrative line or program line of responsibility.

- o Some first- and second-level supervisors interviewed at Site 300 thought their line safety responsibility was through their administrative chain, while others thought it was through the programmatic chain. All agreed, however, that they have a dual-line safety responsibility, the second being through the Resident Manager.

- o See Sections OP.1, MA.1, and PT.1.

CONCERN: (OA.1-3) (H2/C2)

- o All management personnel and staff interviewed at Site 300 do not have the same understanding of the line of their safety responsibilities.

FINDINGS:

- o Mission and function statements, where they exist, are not consistent across LLNL.

- o A few of the departments have some mission/function statements in departmental documents. However, these do not generally go below the division level, and in many cases do not mention safety as part of the mission.

- o Many management personnel interviewed were not aware of any mission/function statements for their department.

CONCERN: (OA.1-4) (H3/C2) Mission/function statements that define the assigned organizational purpose and how this purpose is to be accomplished do not exist for all organizational units.

FINDINGS:

- The Site 300 Safety and Operational Manual states that "The responsibility for the establishment and operation of the Laboratory's Safety Program at Site 300 has been delegated to the Associate Director for Nuclear Design and he has, in turn, delegated this responsibility to the Site 300 Resident Manager."
- Department/division representatives at Site 300 serve in a dual role in which they represent their parent organizations in all respects, while participating in the management of Site 300.
- The responsibility for operational safety at Site 300 lies with the LLNL department/division operating the facility involved. However, this operating staff does not report to the Resident Manager.
- The safety responsibility for technical support to these facilities lies with the department/division performing the work. Like the operating staff, this technical support staff does not report to the Resident Manager.
- Staff safety support is provided by the Resident Manager in conjunction with the technical services staff.
- The Resident Manager has been matrixed into this position from Mechanical Engineering.
- The Resident Manager has no personnel reporting directly to him either administratively or programmatically, and cannot directly and officially reprimand or reward a Site 300 employee.
- The Resident Manager has limited control over the quality or level of training of employees at Site 300.
- The Resident Manager has a very small budget, which is not adequate to correct safety deficiencies or initiate safety upgrades.
- The Resident Manager does not receive sufficient upper- level management support to compensate for the lack of delegated authority, and upper-level management personnel seldom come to Site 300 to obtain a first-hand assessment of the safety needs.
- See Section OP.1.

CONCERN: (OA.1-5) (H1/C2) The Resident Manager does not have sufficient direct authority or resources to fulfill his safety responsibilities.

FINDINGS:

- The LLNL Health and Safety Manual states: "The Laboratory Director is responsible for safety at LLNL. He assigns to all levels of management the responsibility for implementing the LLNL Safety Policy and for maintaining a safe work environment...Although an Associate Director may assign safety responsibilities to others, he remains responsible for ensuring correction of all oversights and errors within his organization that result in injury, illness, property loss, or environmental damage."

- The Associate Director for Nuclear Design has delegated the responsibility for the establishment and operation of LLNL's Safety Program at Site 300 to the Resident Manager.

- Operational safety and technical support safety have been assigned to those operating the facility and those performing the work, respectively.

- The LLNL Health and Safety Manual, Supplement 1.02, states: "Most first-line supervisors have responsibility for employees and for areas where employees and others work. Because of the LLNL matrix system, supervisors may have line responsibility for employees who work in another supervisor's area and may have other supervisor's employees in their area. There are also project leaders who have no line responsibility but in effect function as area or employee supervisors." (See Concern PT.1-1.)

- The LLNL Health and Safety Manual states that "Employees are responsible for their own safety and for...bringing to the supervisor's attention any behavior or condition that may cause injury or illness to others or unacceptable damage to property" and for promptly reporting an occupational injury, illness, or significant exposure to toxic material to their supervisor and to Health Services.

- LLNL issues various organization charts, some show lines of administrative responsibility, some lines of programmatic responsibility, and others (for Site 300) show lines of responsibility to the Resident Manager, which may be neither administrative nor programmatic. Most charts do not indicate the nature of the line of responsibility being depicted.

- See Section PT.1.

CONCERN: (OA.1-6) (H2/C1) For Site 300, it is frequently not possible, as required by DOE 5480.1B and DOE 5482.1B, to trace a single line of safety responsibility from the LLNL Director to the staff performing the task.

FINDINGS:

- o Detailed safety policies and requirements are embodied in DOE Orders.
- o It is the LLNL Director's stated policy to accept nothing less than full compliance with DOE ES&H Policies and Regulations.
- o The DOE/UC contract requires compliance with "all applicable safety and health regulations and requirements (including reporting requirements) of the DOE communicated to the University."
- o The Appraisal Team found more than 40 concerns which indicated lack of compliance with various DOE Orders.

CONCERN: (OA.1-7) (H1/C1) There is no LLNL system in place to ensure that DOE policies and requirements are addressed by the cognizant personnel and that compliance with the requirements is currently maintained. As a result, LLNL operations are being conducted in significant noncompliance with DOE Orders.

OA.2 ADMINISTRATION

PERFORMANCE OBJECTIVE: Administrative programs and controls should be in place to ensure policies concerning health and safety are administered throughout the facility.

FINDINGS:

- o Hazards Control Safety Team members are charged with providing both technical safety advice to, and safety overview of, the same program or facility activities. Their objectivity is thereby potentially compromised.

- o Program managers purchase safety assistance and overview from the Hazards Control Department. Their line safety responsibility is in potential conflict with programmatic objectives. A means to ensure that safety funding is commensurate with its priority has not been established at LLNL.

- o Safety Team members' safety overview objectivity can be compromised by direct participation in programmatic operations. Such participation was observed to have occurred despite Hazards Control Department's instructions to the contrary.

- o See Sections PT.3 and OS.1.

CONCERN: (OA.2-1) (H2/C2) Conflicts of interest between responsibilities for program and safety exist at LLNL.

OA.3 MANAGEMENT OBJECTIVES

PERFORMANCE OBJECTIVE: Site/facility management objectives should ensure commitment to safe operation, including enforcement of approved work practices and procedures.

FINDINGS:

- o Although many safety and program documents state the expectation that activities will be performed safely, there is no sitewide documented requirement that organizational units develop and implement specific safety goals, make individual assignments of disaggregated goals, and measure performance against such goals.
- o Safety goals are not consistent across LLNL.
- o LLNL does not set annual safety goals to achieve specific limits or to improve the overall level of safety (e.g., lost work-day case reduction from the previous year).
- o Of the departments interviewed, only Plant Engineering has written safety goals that are measurable.
- o Some departments have general safety goals in various departmental documents, but in most cases the safety goals are not tracked or charted, nor are they written in such a way that success or failure can be determined.
- o See Section PT.1 and Concern OP.1-3.

CONCERN: (OA.3-1) (H2/C2) LLNL does not require and does not have written and promulgated sitewide safety goals, nor do all departmental elements have specific, measurable safety goals which can be tracked.

OA.4 CORPORATE SUPPORT

PERFORMANCE OBJECTIVE: Corporate interest and support for safe operation should be evident.

FINDINGS:

- The University of California (UC) does not have a safety policy for LLNL operations. The DOE/UC contract contains a safety clause which commits UC to maintain a safe workplace and to comply with DOE safety requirements.
- There is no formal delegation of safety responsibility from the UC Regents to the LLNL Director.
- UC does not address the priority of safety over program objectives. While a number of LLNL policy statements, including the Director's statement, do fully address this safety principle, it is noted that a number of policy statements bearing the title LLNL Safety Policy developed at lower organizational levels do not address safety priority (e.g., Management Plan for Plutonium Facility Operations, Section 5.1).
- Feedback on the status of compliance with safety standards and requirements is not provided by UC to LLNL management. Reviews conducted by UC's Health, Safety, and Environment Advisory Committee do not specifically address this subject, nor is there a requirement to do so in the Committee charter.
- Actions to correct deficiencies in resources to implement needed safety actions are not addressed by UC, but are delegated to the LLNL Director.
- See Section PT.1.

CONCERN: (OA.4-1) (H3/C2) The University of California demonstrates little corporate commitment to safe operations at LLNL.

OA.5 MANAGEMENT ASSESSMENT

PERFORMANCE OBJECTIVE: Management and supervisory personnel should monitor and assess facility activities to improve performance in all aspects of the operation.

FINDINGS:

- Although timely and effective action to track and correct identified deficiencies appears to be the responsibility of the Associate Directors and their management personnel, a sitewide, formally structured set of requirements for this purpose does not exist.

- The Quality Assurance Office (QAO) has published a Quality Problem Corrective Action Guide (M-078-QG-1), but there are no requirements for its use.

- Many of the QA plans were found to have no provisions for nonconformance reporting (NCR) or corrective action reporting (CAR). This is contrary to the requirements of DOE 5700.6B, which invokes ANSI/ASME NQA-1.

- QAO is not apprised of DOE audit findings unless they relate directly to the institutional aspect of QAO.

- Only Laser Programs has a substantial documented history of effective use of NCR/CAR processes.

- The Internal Appraisal of the Plutonium Facility, Bldg. 332 (1987), found a lack of auditing and QA plan implementation. Closure was premised on a commitment to hire a QA engineer for the facility and completion of the audit plan and performance of the audits. To date, these commitments have not been completely met. (See Section QV.1.)

- A recent failure detected by inspection prior to use of high-efficiency particulate air (HEPA) filters caused by latent defects in the filter media resulted in prompt notification of the vendor and inspection of the stock on hand; however, no formal reporting to upper management (NCR/CAR) has been documented. An Unusual Occurrence Report (UOR) has been issued, but this action was very late according to UOR reporting requirements.

- A number of deficiency and corrective action tracking systems have been found at the department level (e.g., the HIRAC database in Hazards Control); however, these systems do not have documented upper management level reporting and analysis requirements. A number of deficiencies were entered into HIRAC in 1985 and still have not been resolved.

- Failures of facility safety systems usually require facility shutdowns until the failure is restored, but there is no requirement that failure root cause be determined. The focus is on facility restart.
- Work controls for corrective action in the Tritium Facility

(Bldg. 331) lack implementing procedures.

- o Upper-level management personnel seldom come to Site 300 to obtain a first-hand assessment of safety needs.

- o See Concerns OA.5-5, FR.6-1, and QV.1-1; and Sections FR.6 and PT.3.

CONCERN: (OA.5-1) (H2/C1) The performance of corrective actions and the prevention of recurrence through addressing basic causes and related generic problems does not meet the Corrective Action requirements of DOE 5700.6B.

FINDINGS:

- o A SAN appraisal of the UOR system, available in draft form, conducted February 5-6, 1990, found that there is no LLNL policy statement available on reporting unusual occurrences. This finding is still valid.

- o There is no sitewide documented process in place at LLNL to collect, review, and analyze UORs to assess root and common causes of, and lessons learned from unusual occurrences, and to distribute such information to LLNL management and supervisors, who might be expected to benefit from such information.

- o The UOR program has not been the subject of an internal audit or appraisal for several years. This finding was also reported in the SAN appraisal referenced above.

CONCERN: (OA.5-2) (H2/C1) The UOR program at LLNL does not conform to the policy and objectives of the Unusual Occurrence Reporting System, DOE 5000.3, Sections 7.a.(5) and 7.b.(2) and (3).

FINDINGS:

- o Some Facility Safety Procedures (FSPs) and Operational Safety Procedures (OSPs) by which LLNL provides information necessary for safe operation directly to employees are incomplete and erroneous (for example, FSP 191 and the FSPs governing high explosives operations involved in three recent incidents).

- o The Health and Safety Manual, which provides a basis for FSPs and OSPs and lower-tier safety manuals, contains permissive wording which subverts the intent of requirements. (For example, Health and Safety Manual Supplement 32.05, Pressure Vessel and System Design, states that "All pressure designers and experimenters <u>should</u> fully understand this material or seek the assistance of...")

- o There is no sitewide requirement for the conduct of supervisor/employee safety meetings to ensure that individual employees understand safety policy and requirements and to provide management with employee feedback on the safety requirements and their implementation.

- See Sections TS.2, FR.3, EP.2, MA.2, MA.4, MA.6, RP.10, and OS.2.

- See Concerns IH.2-1, IH.1-4, OP.6-1, RP.1-1, RP.1-2, RP.3-1, and MA.1-3.

CONCERN: (OA.5-3) (H2/C2) Complete and accurate information necessary for safe operation is not systematically and consistently being developed and promulgated to employees.

FINDINGS:

- There is no sitewide internal audit system to assess the technical adequacy of the activities undertaken to comply with procedural requirements. This assessment is undertaken to varying degrees at the option of the individual Associate Directors.

- Guidance for this optional audit program is provided by Quality Assurance Audits (M-078-QG-2). The guide states that the responsible manager of an activity initiates audits as required in his or her QA plans. A number of activities have no QA plans and a number of others are deficient with respect to auditing requirements.

- No formal mechanism has been established to ensure completeness and consistency of audit activities.

- Internal appraisals are a responsibility of the LLNL Associate Director for Administration and Operations as defined in Health and Safety Manual Supplement 1.13. The Principal LLNL Associate Director periodically reviews this appraisal program for independence and the adequacy of corrective actions. Only seven of these appraisals have been conducted since July 1988; three of them since the first of this year.

- A number of audit and appraisal activities have been undertaken in anticipation of the Appraisal Team's visit. The reviews have documented many of the concerns found in this appraisal.

- See Concerns QV.1-2, PT.3-1, and RP.2-1; and Section FR.5.

CONCERN: (OA.5-4) (H2/C2) The audit program does not provide needed management information on the conduct of activities undertaken to comply with procedural requirements as required by DOE 5700.6B.

FINDINGS:

- While a limited range of operational data reflecting facility safety performance are analyzed and trended by Hazards Control Safety Team Leaders as a service to the Program Associate Directorates, there is no formal specific basis for this activity. A review of data analyzed shows this activity to be of marginal value since it is limited to individual Associate Directorates. However, annual sitewide assessment of such data is performed.

- The Environmental, Safety and Health Council (established January 1, 1990) is chartered to consider such data and provide recommendations to the LLNL Director concerning appropriate actions; however, there is no defined mechanism for routinely providing this information to the Council.

- See Sections TS.4, FR.6, and MA.7; and Concern OA.5-1.

CONCERN: (OA.5-5) (H2/C2) A sitewide system for analysis and trending of operational data and consequent corrective action has not been developed and implemented by LLNL.

OA.6 PERSONNEL PLANNING AND QUALIFICATION

PERFORMANCE OBJECTIVE: Personnel programs should ensure that appropriate job qualification requirements or position descriptions are established for all positions that affect safe and reliable operation.

FINDINGS:

- o There is no effective sitewide set of requirements for personnel management and development.
- o The assurance that personnel have the necessary qualifications and experience to perform satisfactorily is delegated to the Associate Directors. Statements of required qualifications are established at the time of hiring and are not required to be periodically reviewed.
- o Specific job objectives are embodied in the form for annual performance appraisals, but these are general, vary from one Associate Directorate to another, and often do not address safety considerations except in a pro forma manner.
- o Guidance for the conduct of performance appraisals is embodied in the Personnel Manual. No requirements for use of the guidance are established by the Manual.
- o No audits of the conduct of performance appraisals have been performed since 1982. The 1982 audit showed that a major fraction (~80 percent) of LLNL personnel were being appraised. The audit did not address the safety performance of personnel.
- o The University of California appraises the LLNL Director's performance every 5 years. The current Director has not been appraised, but he has been in place only 2 years.
- o Sitewide career advancement programs and a supervisory and management succession plan have not been developed and implemented. These matters are discussed and defined on a case basis through Director/Associate Director meetings.
- o See Sections OP.1 and MA.1.

CONCERN: (OA.6-1) (H3/C2) Means to ensure that job descriptions and qualifications reflect LLNL needs, and that personnel performance is measured in a consistent way, have not been established at LLNL.

FINDINGS:

- o The Appraisal Team found that many positions lack job descriptions. Those that do exist are usually generic and are not documented consistently.
- o Some safety responsibilities are listed in the LLNL Health and Safety Manual and others in the Site 300 Safety and Operational Manual. However, these are general in nature and may apply to similar classes of management or staff.

- o In many cases generic job descriptions exist for purposes of advertising to fill job vacancies. These usually apply to a wide range of similar positions. These job descriptions are generally adequate for the working-level staff in identifying individual safety responsibilities.

- o Job performance evaluations list some assigned duties and responsibilities, but do not always include safety responsibilities.

- o See Section MA.1.

CONCERN: (OA.6-2) (H3/C2) Specific position/job descriptions, which delineate specific safety responsibilities, do not exist for all management personnel.

OA.7 DOCUMENT CONTROL

PERFORMANCE OBJECTIVE: Document control systems should provide correct, readily accessible information to support site/facility operations.

FINDINGS:

- Sitewide, the status of SARs and SAs is acknowledged by LLNL to be unsatisfactory.
- Of the high hazards facilities (Plutonium Facility, Tritium Facility and Heavy Element Facility), only the Plutonium Facility has a current SAR, but this SAR has not yet been approved by DOE-HQ. The Tritium Facility SAR was originally written in the 1970s but never approved by DOE. A contract with a vendor is in place to update the SAR to represent the facility as it exists and to meet current standards. The Heavy Element Facility SAR was written in 1982, was approved by DOE in 1985, and is currently under consideration for updating.
- At the LLNL main site, the SAs of some moderate hazard facilities are satisfactory, but a large number are not.
- Large numbers of low hazard facilities at the LLNL main site do not have current SAs.
- For many facilities, OSRs are embedded in the SAs. (See Concern TS.2-4.)
- The completion dates for SAs for the facilities at Site 300 vary from 1981 to still in progress.
- The SAN Management Directive (MD) 5481.1A, dated September 20, 1989, requires that "The cognizant line organization will review all applicable operations and new projects on a case-by-case basis in order to establish a preliminary 'Hazards Class' and to determine specific SA requirements."
- The SAN MD 5481.1A also requires a "Safety Analysis Document (SAD) for all low hazard and all moderate hazard non-nuclear facilities/operations"; and "The SAD shall be completed for all operations/projects that present potential hazards to operations personnel and have minor effect on the public or the environment."
- For Site 300, SAN/LLNL have identified 31 facilities/operations and 55 magazines that are classified as presenting a moderate or low hazard. (Moderate hazard facilities include 27 facilities/operations and 46 magazines; low hazard facilities include 4 facilities/operations and 9 magazines.)
- Of the 31 moderate and low hazard facilities/operations at Site 300, 12 have SARs and 19 are in varying degrees of preparation.

- o Of the 55 magazines that are classified as presenting moderate or low hazards, a SAR is being prepared for only 3.

- o See Concerns FR.3-1, OP.1-2, TS.2-2, TS.2-3, TS.2-4, and QV.1-2; and Sections FP.3 and EP.7.

CONCERN: (OA.7-1) (H2/C1) LLNL is not in compliance with DOE 5481.1B and SAN MD 5481.1A for the preparation of safety analysis documents for all facilities.

FINDINGS:

- o Procedures and other instructions important to safety are not controlled to ensure that the most current revisions are available to those who need the information. The LLNL Health and Safety Manual and the Site 300 Safety and Operational Manual are not considered by all supervisors to be controlled documents.

- o Neither manual is numbered, nor is there a positive system to ensure that all copies are kept up to date. Document audits are not conducted.

- o Not all copies viewed in the field were up to date.

- o Copies of these safety documents that were provided to the Appraisal Team could be picked up by any LLNL staff member and thus are not controlled.

- o Both manuals contain procedures and instructions that should be kept up to date.

- o In preparation for the Tiger Team visit, LLNL reviewed the status of "as-built" drawings for facilities and found them to be frequently deficient or unavailable and uncertain as to who had responsibility for them.

- o See Concern QV.1-1 and Section EP.5.

CONCERN: (OA.7-2) (H2/C2) Current key safety documents are not available and controlled in accordance with recommended standards such as ANSI/ASME NQA-1 as indicated in DOE 5700.6B. (See Concern TS.3-2.)

OA.8 FITNESS FOR DUTY

PERFORMANCE OBJECTIVE: A Fitness-For-Duty Program should be capable of identifying persons who are unfit for their assigned duties as a result of drug or alcohol use, or other physical or psychological conditions, and should provide procedures to remove them from such duty and from access to vital areas of the site or facility pending rehabilitation or remedial actions.

FINDINGS:

- o LLNL has promulgated a substance abuse program which aims at a drug-free workplace. Supervisors have been trained to detect and deal with cases of substance abuse. An employee assistance program has been established to provide abuser rehabilitation and counseling.

- o While the LLNL Substance Abuse program embodies "testing for cause" for substance abuse, urine testing related to pre-employment and preassignment to sensitive activities is not used. However, assignment to sensitive activities is conditional upon the results of extensive physical and psychological testing which potentially could detect substance abusers without subjecting them to chemical testing.

- o The Substance Abuse policy is not applied to construction contractors. Instead, a list of prohibited articles is contained in all construction contracts, and persons detected as being under the influence of a controlled substance can be removed from LLNL and denied further access. Contractor personnel are subject to search and such searches have been performed. No formal guidance has been established for this purpose. Contract managers and inspectors are not trained to detect and handle substance abuse; however, their supervisors are trained.

- o The Substance Abuse policy is not applied to supplemental labor contractors. There is a provision in relevant contracts which reserves the option to the University of California (UC) to direct the seller to institute a preaccess controlled substance testing program, a "for cause" controlled substance testing program, and a controlled substance rehabilitation program for the seller's employees. This provision has not been implemented. Supplemental labor contractor employees are treated in a manner similar to that afforded to construction contractors as discussed above.

- o Visitors are provided with a list of prohibited articles but not with applicable details of the Substance Abuse Policy. Visitors found under the influence of a controlled substance can be removed from LLNL and barred from further access.

CONCERN: (OA.8-1) (H2/C2) The LLNL fitness-for-duty program is deficient with respect to its application to prospective employees, employees in sensitive positions, visitors, and subcontractor employees.

B. QUALITY VERIFICATION

The scope of the Quality Verification appraisal included all seven Performance Objectives in this discipline. The Appraisal was conducted by interviews with LLNL staff and crafts personnel; observation of activities in progress; and review of pertinent documentation, including the Quality Assurance Manual (QAM), Quality Assurance Plans (QAPs), Health and Safety Manual (HSM), Facility Management Plans, Facility Safety Plans, Safety Analysis Reports, and relevant procedures and records sitewide. The facilities reviewed included the High Explosives Applications Facility (HEAF) at the main site, Bldg. 345 Detonator Research, and all major facilities at Site 300, including Bldg. 873 Welding and Mechanical Engineering Shops, Bldg. 874 Plant Engineering Electric Shops, Bldg. 848 Weather Station, Receiving and Warehouse facility in Bldgs. 875 and 876, the East Firing Area, Chemistry Area, Process Areas, and Physical Environmental and Dynamic Test Area. Interviews were conducted with personnel in the Materials Management Group, Environmental Quality Verification Group, Revitalization Program, and Environmental Restoration organization. The LLNL main site facilities reviewed included all high hazard facilities (Bldg. 251 Heavy Element Facility, Bldg. 331 Tritium Facility, and Bldg. 332 Plutonium Facility) as well as selected moderate hazard facilities, programs, and special service organizations. These included the Bldg. 334 Hardened Engineering Test Facility, the Special Isotope Separation Engineering Demonstration System (SIS-EDS), facilities of the Lasers Program, the Portable Radiation Detection Instruments Section, the Calibration Services Section of the Engineering Services Division, the Quality Assurance Office (QAO), the Mechanical Inspection Services Group of the Materials Fabrication Division, the Nondestructive Evaluation Section Facilities, Bldgs. 3226 and 329, and Receiving areas in Bldg. 411 and the Lasers Program.

The quality assurance (QA) program at LLNL has been documented in the QAM M-078, Rev. 1. It contains a Director's Statement that establishes the LLNL policy that all programs and line organizations use quality assurance to provide confidence that objectives will be achieved. The QAM is not effective in defining requirements and standards to meet the objectives. The QAM does not contain the requirements in DOE 5700.6B for the selective application of the elements of quality assurance in national standards and for independent verification of quality achievement. It does not require that Quality Assurance Plans consider QA elements. As a consequence, the QAPs do not reflect independent verification as a part of the line QA program and do not fully reflect consideration of all QA elements. The QAPs lack specificity in most instances. Performance indicators are not included. In most cases, the QAPs are either not implemented or are not available at Site 300. The QAO performs no surveillance or walkthroughs of sitewide facilities, and only four QA audits at Site 300 have been performed in the past 3 years. None have yet been done in 1990 and none have been scheduled. Audits at the LLNL main site and the Internal Appraisal program are ineffective and insufficient to meet the criteria for periodic program evaluations cited both in the LLNL QAM and DOE Orders. The QA program as implemented at Site 300 and HEAF does not surface issues for senior LLNL management information and action.

Procurement of materials sometimes requires onsite inspection at vendor sites. Procurements do not require review by Hazards Control except when the requisition indicates that it is for hazardous materials. There are no requirements for independent review of procurement by the QAO for verification of the safety significance of the procurement. These responsibilities are with the line organization. Receiving and preinstallation inspections are not addressed in the LLNL QA program.

LLNL does not have a sitewide calibration policy for measuring and test equipment. Each program establishes its own requirements. Hazards Control sitewide has implemented a control and tracking system to ensure that all radiation monitors are uniquely identified and within calibration intervals. Some other programs have developed less formal calibration systems, while most have not addressed the issue. The Lasers Program is one exception. The QAO has no regularly scheduled overview of calibrations other than QAO audits (which contain some calibration requirements). The Performance Objectives related to inspections and control of special processes were reviewed but found to be not applicable at Site 300. Control of special processes at the LLNL main site is considered to be satisfactory even if these processes are not regulated by formal administrative controls. With a few exceptions, the inspections program at the LLNL main site is mostly informal, undocumented, and insufficient.

QV.1 QUALITY PROGRAMS

PERFORMANCE OBJECTIVE: Administrative programs and controls should be in place to ensure policies concerning quality are administered for each facility throughout the site.

FINDINGS:

- The LLNL quality assurance program is documented in Quality Assurance Manual (QAM), M-078, Rev. 1, dated September 1985. This document does not meet the DOE 5700.6B requirement for quality assurance program plans to include independent verification of quality attainment.

- The Quality Assurance Plans (QAPs) developed by program divisions sitewide do not include provisions for independent verification of quality attainment. There are no independent sitewide verification activities to ensure management that design reviews are conducted and documented in accordance with established procedures, that maintenance activities are conducted in accordance with requirements, that procurement and supplier control systems are implemented, that measuring and test equipment is calibrated and controlled, and that systems important to safety are identified and receive appropriate quality assurance and quality control. The Lasers Program is a notable exception.

- The LLNL QAM does not meet the DOE 5700.6B requirement for the selection and application of the QA elements of industry standards such as the preferred standard for nuclear facilities, ANSI/ASME NQA-1. The QAM does not consider the NQA-1 elements for control of interfaces between organizations; qualification of inspection and test personnel; design control; procurement document control; document control; control of purchased items and services; control of special processes (such as welding and nondestructive testing); test control; control of measuring and test equipment; handling, storage, and shipping; inspection, test and operating status; and control of nonconforming materials. It fails to notify that the DOE Order provides for exceptions from nonessential elements on the basis of approved written justification.

- The QAPs applicable to the program divisions at Site 300 range from good to nonexistent. The Materials Fabrication Division QAP dated May 19, 1988, contains many QA elements but lacks consideration of procurement document control, document control, independent verification, and corrective action systems. Many of the other plans are nonspecific and lack performance indicators. None contain provisions for independent verification of quality achievement. This is dependent on audits by the Quality Assurance Office (QAO). Many QAPs indicate that the QAO audits are performed when requested by the program.

- Since 1977, 131 QAPs have been prepared, with or without QAO assistance, but all except one have had QAO review or approval. Some are still in draft (neither approved nor released) but have had M-078 dash numbers assigned by QAO, who is responsible to track the QAPs. Of the total, 46 are active, 2 are completed, 1 is unofficial, and 10 are drafts. The balance of 72 are inactive (i.e., previously used for specific programs or projects), but are superseded, canceled, or otherwise terminated. The Appraisal Team has reviewed 21 QAPs at the LLNL main site and has found none to be in full compliance with DOE 5700.6B. The 1985 QAP for the Materials Fabrication Division is incomplete and has never been incorporated in the official numbering system. The Nondestructive Evaluation (NDE) Section of Engineering Sciences Division, QAP M-078-04, October 1978, is the best written in terms of specifically defined and described QA actions, but is also incomplete. The Engineering Demonstration System (EDS) Operations QAP, M-078-41, October 1988, is most nearly complete in terms of addressing elements of ANSI/ASME NQA-1, but often lacks specificity. The three packaging and transportation related QAPs, M-078-91, -92, and -93, are inconsistent with each other and with DOE 5700.6B. A draft QAP for Tritium and the QAP for the Plutonium Facility have the same number, M-078-20.

- See Sections OA.5, QV.2, QV.3, QV.4, QV.5, QV.6, QV.7, FP.7, RP.7, PT.3, OS.1, OP.1, and TS.4.

- See Concern OA.7-2.

CONCERN: (QV.1-1) (H2/C1) The LLNL quality assurance program does not meet the requirements of DOE 5700.6B for independent verification of activities that affect quality and for the selective application of the quality assurance elements in the recognized standard ANSI/ASME NQA-1.

FINDINGS:

- At LLNL, many QA functions elsewhere commonly assigned to QA organizations are assigned to the line organization.

- Some QAPs were up to date, but one had not been revised in over 12 years. The QAP for the NDE Section, M-078-04, is dated October 1, 1978. Some QAPs, such as the QA Policy and Plan for W Program and Weapons Engineering Division dated March 25, 1985, and reissued September 22, 1989, were not available at Site 300. Other QAPs are developed but they are not implemented. Some examples of QAPs that are not implemented are those for Nuclear Design, Nuclear Explosives Engineering Division, Nuclear Energy Systems Division, and Plant Engineering Site 300 Division.

- At the LLNL main site, the Engineering Division and Electronics Services Group lack approved QAPs. Mechanical Engineering and Materials Distribution Division have QAPs in draft. Bldg. 331 Tritium Facility has a new QAP under development, as does the

Uranium Atomic Vapor Laser Isotope Separation (AVLIS) program. Some directorates and divisions that do have QAPs at the highest levels fail to provide specific requirements and specific guidance to the divisions, sections, and groups who must also prepare QAPs.

- At Site 300, the Environmental Restoration Program could not provide a quality assurance document to the Appraisal Team.

- The Site 300 Materials Management QAP for Safe Packaging of Hazardous Materials for Shipping or Transport, M-078-91 Rev.1, April 1989, has been implemented for only about 1 year. No surveillances or audits have been conducted by the QAO. (See Section PT.3.)

- The QAO does not perform surveillance of ongoing activities. No representatives from QAO routinely visit Site 300 for surveillance or walkthroughs. The only visits are for the conduct of infrequent audits.

- Over the past 3 years, only four quality assurance audits have been conducted at Site 300. Two were conducted during 1987, two were conducted in 1988, none were conducted in 1989, and none have yet been conducted or scheduled for 1990. The audit reports address compliance to the Program Division QAP but do not address adequacy of the QAP. (See Concern PT.3-1.)

- Audits at the LLNL main site have been conducted more frequently (generally at the request of specific programs); however, these audit reports also fail to address the adequacy of the QAP.

- Audit findings are not tracked or closed by sitewide management. The QAO performs no analysis of the findings for causal factors, trends, or other deficiencies that require management attention.

- The Appraisal Team has verified that a high percentage of QA findings from SAN audits in 1985, 1987, and 1989 have not been satisfactorily resolved; these findings are confirmed by this Appraisal Team.

- The QAO does not have an audit and surveillance strategy or any other mechanism to actively collect information about the status of the QA Program, nor a system for the sitewide dissemination of lessons learned.

- The evaluation strategy employed sitewide is to provide for "Internal Appraisals" under the direction of the Associate Directors. Depending on the program, the appraisals are either annual, biennial, or triennial. A review of four of the latest appraisals determined that they were not effective. The High Explosive Safety and Nuclear Explosives Safety appraisals failed to address QA or quality verification. The Bldg. 332 Plutonium Facility closed prior appraisal findings solely on the basis of work in process concerning completion of the QAP and auditing, while the Appraisal Team found that the promised auditing has

never been done and the QAP does not meet DOE 5700.6B requirements. The appraisal of the Bldg. 251 Heavy Element Facility in July 1989 found no deficiencies in compliance with DOE 5480.5, even though that facility clearly does not meet the QA provisions of that Order.

- The QAP document is controlled in only one instance: at the Plant Engineering Division. Other document control systems are not in evidence. The Site 300 QA records files that include QAPs, audit reports, and other QA actions are out-of-date.

- Sitewide management has not implemented formal actions to fulfill the QA Policy requirement to review annually the QAPs and supporting documents of each sitewide operating group.

- The QAO has not fulfilled its responsibility to provide QA training and auditor certification for line organization personnel. No one interviewed at Site 300 had received any QA training from QAO. There are few exceptions to this finding at the LLNL main site.

- The HEAF has included a Quality Assurance Section in the Facility Management Plan, dated July 14, 1989. The Quality Assurance Section does not address how the QA Program will accomplish its stated purpose, "to provide the (Facility Management) mechanisms and information channels that allow him or her to control activities." No QAP has been developed, as required in DOE 5700.6B, that addresses what will be controlled, how it will be controlled, and when it will be controlled. There is no consideration of the elements of a quality assurance program, nor is it clear how the QA program will ensure fulfillment of the objectives of the Facility Management Plan, the Facility Safety Plan (FSP), or the Safety Analysis Report (SAR). The QAP deficiencies of this finding also apply to Bldg. 332 Plutonium Facility and Bldg. 251 Heavy Element Facility.

- The SAR is not in compliance with Health and Safety Manual Supplement 6.06, September 1988, that requires a QA section to the SAR. It is to contain a list of the QA requirements that will ensure that the established QA objectives are being met.

- The SARs for Bldg. 251 Heavy Element Facility (SAR UCID-19579, October 1982) and Metal Production Line Facility (SAR UCID-20429, February 1986) lack a QA section.

- The SAR for Bldg. 331 Tritium Facility is being revised by a contractor to add a QA section, among other revisions.

- The SAR for Bldg. 332 Plutonium Facility (UCAR-10211) is still in draft form. Along with the recently approved SAR for Bldg. 334, Hardened Engineering Test Facility, QA sections are provided, but they do not specify how the QA elements will mitigate/alleviate hazards or risks.

- See Concerns OA.7-1, RP.2-1, and OA.5-4; and Sections FR.4, FR.5, PT.3, TC.1, and OP.1.

CONCERN: (QV.1-2) (H2/C1) Quality assurance (QA) requirements are not being implemented to meet DOE 5700.6B and the LLNL Quality Assurance Manual requirements for QA elements such as auditing, staff training, and developing and implementing quality practices.

QV.2 PROCUREMENT AND SUPPLIER CONTROL

PERFORMANCE OBJECTIVE: Provisions should be established for the control of purchased material, equipment, and services; for selection and control of suppliers; and for assessing the adequacy of procurement activities.

FINDINGS:

- Procurement requests for spare parts, equipment, and materials are initiated sitewide. They sometimes include requirements for compliance with codes and standards and may specify vendor certifications or vendor site inspections by LLNL. There is no requirement for independent review by the Hazards Control Department (HCD) or by the QAO to ensure that the requirements for the safety significance of the procurement are established correctly (e.g., application in SAR-designated safety systems).

- Only identified hazardous and safety-related material procurement are subject to approval by HCD. The requester indicates hazardous material on the purchase order request. The Health and Safety Manual requires that the Procurement Department screen all requisitions to meet this review requirement. Hazardous materials received by LLNL are inspected for damage and conformance to the requisition. They are then released to the user. There are no independent checks or audits of the system to ensure that all hazardous materials requested receive concurrence from HCD.

- Requisitions in high hazard facilities (Bldgs. 251, 331, and 332) that affect Building Safety Systems (BSSs) are routinely reviewed by HCD personnel assigned to the facility; however, they do not have a formal approval by HCD, nor are there any procedures or administrative controls to verify that HCD reviews these requisitions. QA coordinators may or may not review requisitions, depending on the practice of the Facility Manager, but have no approval authority, nor do they provide independent verification of the adequacy of the procurement process.

- Requirements for independent review (such as by the QAO) of safety significance for purchased materials have not been developed and implemented.

- See Concern PT.3-3.

CONCERN: See Concern QV.1-1.

QV.3 RECEIVING AND PREINSTALLATION INSPECTIONS

PERFORMANCE OBJECTIVE: Provisions should be established for the inspection of purchased material, equipment, and services in accordance with documented procedures by trained personnel.

FINDINGS:

- LLNL inspections at vendor sites are performed when specified by the requisitioning organization. Test requirements, inspector hold points, and acceptance criteria are established in the specifications by the line organization. Independent review and verification of such requirements is not required (e.g., applications for safety systems).
- Materials and equipment used at the LLNL main site are generally delivered to the requisitioners for acceptance testing and/or inspection. No provisions for the use of formal procedures or independent verification is established except for the Lasers Program.
- The receiving organizations at Site 300 perform no technical inspections, tests, or measurements of incoming material. Visual inspections are made for apparent damage and for general conformance to the requisition.
- At the LLNL main site (Bldg. 411), some dimensional checks are made at the request of the requisitioner, but procedures are old, uncontrolled checklists.
- See Section PT.6.

CONCERN: See Concern QV.1-1.

QV.4 CALIBRATION PROGRAM

PERFORMANCE OBJECTIVE: Provisions should be made to ensure that tools, gauges, instruments, and other measuring and testing devices are properly identified, controlled, calibrated, and adjusted at specified intervals.

FINDINGS:

- LLNL has no established sitewide calibration policy for control of instruments, gauges, tools, and other measuring and test equipment as required by DOE 5700.6B and ANSI/ASME NQA-1. Each division establishes its own requirements. There is no independent assurance that calibration activities conform to accepted codes and standards. This issue was previously identified in the SAN Quality Assurance Appraisal dated September 20, 1985.

- Site 300 has not established a calibration policy. Each program activity develops its own requirements.

- Only one Site 300 organization has developed a tracking system to monitor status of calibration. HCD has implemented such a system. It uniquely identifies each instrument and shows its location, the last calibration date, and the calibration due date. A few organizations have developed lists of instruments to be calibrated, but most have not implemented any formal calibration program.

- HCD has implemented a similar system at the LLNL main site, but it relies solely on facilities personnel for compliance. There is no policy to verify that uncalibrated equipment cannot be used.

- The Lasers Program has established calibration controls at the LLNL main site, but its labeling procedures for installed equipment are not consistent with the procedures used by calibration facilities such as the Electronic Instrument Services Section.

- Some QAPs include a requirement for establishing a calibration assurance activity. This requirement has not yet been implemented. Review of the facilities indicates that most depend on the organization that performs the calibration to maintain records and traceability to national standards. Most facilities do not have a listing of the instruments which require calibrations.

- Calibrations sitewide are performed by onsite technicians, by LLNL main site shops, and by outside vendors. Onsite technicians perform calibrations and functional tests of equipment used in the test programs. These consist mostly of electronic and high-speed photography equipment. Records of dry runs and test runs are maintained. Procedures that indicate which records are to be maintained are usually not available.

- o LLNL main site shops perform calibrations and maintain a master list of devices in the calibration system. There is no recall system to ensure calibration maintenance; each user must request calibration services, except for the Lasers Program.

- o Vendor calibrations are the responsibility of the cognizant program but most lack administrative controls to ensure effective utilization and consistent implementation of the vendor support.

- o The LLNL QAM does not address calibration as required by DOE 5700.6B and ANSI/ASME NQA-1. No policy or guideline for LLNL organizations is given.

- o See Concern QV.1-1 and Sections MA.2 and RP.8.

CONCERN: (QV.4-1) (H2/C1) There is no sitewide LLNL calibration policy for measuring and test equipment as required by DOE 5700.6B and ANSI/ASME NQA-1.

QV.5 IDENTIFICATION AND CONTROL OF HARDWARE/MATERIALS

PERFORMANCE OBJECTIVE: Provisions should be established to identify and control the use or disposition of hardware, materials, parts, and components as well as to ensure that incorrect/defective items are not used.

FINDINGS:

- The LLNL QAM and the program division QAPs do not address the requirement for identification and control of hardware. The program divisions and facility managers are responsible to ensure that materials used in new applications, maintenance, and modifications meet the established requirements. Only one of the Site 300 QAPs reviewed contained provisions for nonconforming materials.
- At the LLNL main site, Materials Fabrication Inspection Section personnel mark the material they inspect per the print-by-engraving processes. They use informal, uncontrolled procedures in doing so.
- Rejected materials at Receiving (Bldg. 411 and Lasers) and at Mechanical Inspection (Bldg. 321) are tagged, but special isolation or segregation areas are not provided.
- There are no provisions for Material Review Boards or other independent reviews of the disposition of rejected material. Reject material may be "used as is" at the discretion of the requisitioner alone.

CONCERN: See Concern QV.1-1.

QV.6 INSPECTIONS

PERFORMANCE OBJECTIVE: Prerequisites should be provided in written inspection procedures with provisions for documenting and evaluating inspection results.

FINDINGS:

- o Documented inspections are carried out at the LLNL main site in an orderly manner by Mechanical Inspection groups, NDE personnel, and Lasers Program personnel to the requirement levels requested by their customers; however, except for the Lasers Program, only informal and uncontrolled procedures and checklists are used.

- o Inspection personnel at the LLNL main site are all well qualified, trained, and certified. Their on-the-job training programs are not well documented and controlled. (See Section TC.8.)

- o Neither facilities QA personnel nor the QAO participate in independent verifications of satisfactory work completion and modifications. If the plant engineer does not otherwise provide for inspections, the work is self-inspected by those performing it.

- o None of the audit reports reviewed (and few of the QAPs) address inspections as an element of their program, nor is independent verification specified.

CONCERN: See Concern QV.1-1.

QV.7 CONTROL OF SPECIAL PROCESSES

PERFORMANCE OBJECTIVE: Provisions should be established to ensure the acceptability of special processes such as welding, heat treating, nondestructive testing, and chemical cleaning, and that special processes are performed by qualified personnel using qualified procedures and equipment.

FINDINGS:

- The sitewide QA Manual (M-078, Rev. 1) does not address the Control of Special Processes nor do any of the QAPs reviewed (except for M-078-04).
- The QAO is not involved in verification activities to assure conformance with applicable codes, standards, QA procedures and specifications except through infrequent audits and internal appraisals.
- The Lasers Program has implemented a comprehensive set of welding and brazing procedures, including training and certification, but did not incorporate the requirements into their QA Plan (M-078-41).
- Facility managers use the access lists to their buildings to ensure that craftspersons (welders, etc.) are qualified and/or certified to do work in their areas. No administrative procedures document this practice even though copies of certifications and test results are on file as QA records.
- The NDE Section (Bldg. 3226) practices conforming control of special processes, including training and certification, but their QAP lacks some elements of DOE 5700.6B and is not compatible with the National Fire Protection Association (NFPA) codes for records storage in ANSI/ASME NQA-1.

CONCERN: See Concern QV.1-1.

C. OPERATIONS

This Appraisal addressed all eight Performance Objectives in the Operations area. Major attention was focused on LLNL Site 300 operations of the B-, W-, and Chemistry Divisions and of the Process Area (Materials Fabrication Division and the Nondestructive Evaluation Section of the Engineering Sciences Division), plus operations of the Laser Programs Directorate, the Chemistry and Materials Science Directorate, and the Nuclear Chemistry Division on the LLNL main site. Due to time limitations, the LLNL main site appraisal had to be restricted to those operations that were judged to have the greatest safety vulnerability. The appraisal of Site 300 operations was augmented to include operations in the High Explosives Applications Facility (HEAF) on the LLNL main site (Bldg. 191). The scope of the main site appraisal included observations of operations in 25 buildings; discussions with more than 150 managers, professionals, and support personnel; and a detailed review of pertinent safety documentation. The buildings in which main site operations were appraised were 121, 151, 161, 162, 165, 166, 169, 214, 222, 235, 241, 243, 251, 321, 322, 327, 331, 332, 341, 361, 391, 481, 482, 490, and 1677.

Because of the recent standdown of all high explosives (HE) operations, the Site 300 appraisal process consisted of observation of dry runs of operations and walkthroughs of the various facilities with supervisors and operators. An in-depth evaluation of the functional aspects of operational safety was not possible during the appraisal period. Operations and processes reviewed included explosives machining, radiographic inspection, isostatic pressing, explosives waste cleaning, explosives firing, as well as flash X-ray, dynamic and thermal testing, and explosives mixing. In each case, managers, supervisors, and operators were interviewed in order to obtain an understanding of how operations were performed and controlled. Logbooks, training records, and operating procedures were examined and discussed. Actual HE operations, however, were not observed.

Operations at Site 300 appear to be conducted in an informal manner, but with safety overriding all other considerations. Employees at all levels have been made aware that safety is of first concern and should accordingly be integrated into their thinking and activities. The role of the experienced supervisor or manager cannot be underestimated in achieving and maintaining a high level of safety consciousness. Many Site 300 supervisors have over 15 years of work experience at the site. Many LLNL main site managers with line responsibilities for operational safety seldom visit Site 300 facilities to review, or to update their knowledge about, the operations for which they are responsible. As a rule, LLNL main site managers do not play a significant role in ensuring compliance with the policies and procedures that govern the operations at Site 300.

Extensive administrative and physical controls are employed in all Site 300 operations, although commonly used guidance mechanisms such as checklists are not routinely employed. Particular emphasis is placed on any operation that involves HE handling or radiation. The Site 300 Safety and Operational Manual, which supplements the LLNL Health and Safety Manual, provides a comprehensive set of procedures for the standard operations at Site 300. Operational Safety Procedures (OSPs), usually initiated by those performing experiments at Site 300, are mandatory for all other operations having an inherent hazard potential. The Appraisal Team observed a lack of strict adherence to policies and procedures governing operations at Site 300

facilities. Also lacking is a formal document defining the safety responsibilities and authorities of Site 300 managers and supervisors.

The matrix type of organization is complicated and therefore difficult to understand. However, the long tradition and successful functioning of the matrix organization at LLNL is accepted by all personnel and appears to cause few difficulties in operations of the facilities or in understanding management authorities and responsibilities. The lack of uniformity in the formal administrative controls for operations between different parts of the organization reduces the effectiveness of the administrative controls and in some cases results in noncompliance with DOE Orders and SAN Management Directives. Also, safety performance goals are not uniformly established for all operations groups; nor is there a sitewide requirement to address employee safety performance as part of the annual performance appraisals.

At the LLNL main site, control room operations were observed to be carried out in a thorough and professional manner. Sufficient supervision was present in active control areas to monitor operations, to respond to off-normal events, and to incorporate plans for subsequent operations. Shift logs were observed to be maintained properly in the few areas that have shift operations.

Operators must complete a series of formal training courses and 6 months or more of on-the-job training before being qualified for independent operational responsibilities. For most operations (particularly those in the Site 300 Process Area) an annual requalification review is required. By and large, supervisors monitor systems and employees on a daily basis and observe operator proficiency, performance, and fitness to perform hazardous operations. Determining the nature and extent of the on-the-job training program for a novice operator-to-be is primarily the responsibility of the facility supervisor. The training, qualification, and maintenance of skills of operators are not covered by formal Site 300 procedures and guidelines. Regardless of the degree of training or expertise of an operator, working alone is not permitted in operations where a high energy potential is present. There are no written procedures directing how operators-in-training may be used to support operations.

Facility Safety Procedures for bunker explosive experiments at Site 300 are not sufficiently detailed to guide the operations staff when unusual or abnormal situations are encountered at the firing table. Not covered, for example, are experiments where unexpended energetic materials are to be intentionally left on the firing table after a firing operation.

Operational Safety Procedures were noted throughout the LLNL main site and appropriate review and sign-offs were evident. Logbooks were kept in most experimental areas reviewed. There is a concern that there is not sufficient use of procedures in Bldg. 331, as recent tritium release reports cited lack of procedure as a main cause for the releases.

The Facility Managers for the individual buildings at the LLNL main site are responsible for the parameters, controls, and documentation requirements to ensure a safe operation. Alarms, interlocks, key-control panels, and status panels provide proper control to critical equipment. Locks and tags observed at operational facilities were effectively and correctly employed, with the exception of one lock and tag that should have been removed years ago. However, the Health and Safety Manual, Supplement 26.13, General Lock and Tag

Procedure, does not comply with the provisions of 29 CFR 1910.147, as supervisors and employees are not fully trained on the use and inspection of locks and tags.

Sufficient support equipment and material was readily available to support normal operations. Housekeeping was generally good in all operational facilities. Some clutter and lack of order was evident in the vicinity of the firing tables at both bunkers visited at Site 300.

Operators and experimenters were vigilant in carrying out their activities. Attention was given to airborne radiation alarms and system pressure readings when performing activities using tritium in Bldg. 331. All operators interviewed were aware of the OSP-defined courses needed, and verified that they had taken them (and were updated as required). On-the-job familiarization with building and safety practices was cited as a requirement before independent operation at LLNL. The fact that safety-related information such as lessons learned, Unusual Occurrence Reports from other DOE sites, and accident investigation reports from other LLNL areas are not being received by the workers prompted a concern.

Of the facilities surveyed on the LLNL main site, routine shift operation was in effect only in the Laser Demonstration Facility (LDF). Observation of shift turnover showed it to be carried out professionally. Turnover of information was facilitated by physical props. Format for the turnover was well-defined and followed by all members of the incoming and outgoing crews. Day supervision was present, but did not lead the meeting. The "lead experimenter" participated, but the primary meeting leaders were the "lead technicians." A separate turnover was carried out between the incoming and outgoing shift supervisors. The shift schedule (10-hour shifts) allows for a 2-hour transfer of responsibilities, which is very helpful in maintaining continuity of operations.

Despite the sophistication of many of the LLNL main site facilities (particularly in the Laser Programs), human factors engineering has not routinely been considered in their design, operations, and maintenance as stipulated for nonreactor nuclear facilities by DOE 6430.1A on General Design Criteria. LLNL has a resident organization with highly developed capability in the field of human factors engineering. This group provides human factors engineering services to many outside agencies, but very little to LLNL program organizations. In fact, LLNL has no standards, or even guidelines, for the inclusion of human factors engineering in the design, layout, and operations of its facilities.

OP.1 OPERATIONS ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Operations organization and administration should ensure effective implementation and control of operations activities.

FINDINGS:

- o LLNL main site managers have not set precise, measurable safety goals and performance indicators for Site 300 facilities.
- o Some LLNL main site managers are not well versed in Site 300 operations and their safety implications because they infrequently visit the site.
- o Because of the lack of backup, any significant turnover in Site 300 operating supervisors could unfavorably impact safety.

CONCERN: (OP.1-1) (H2/C2) LLNL main site management does not maintain a continuous, in-depth involvement in Site 300 operations and safety issues.

FINDINGS:

- o Site 300 organization charts do not clearly delineate lines of authority.
- o A formal document does not exist to define the authority, responsibility, and accountability of each organization at Site 300.
- o The responsibilities and authorities of each position involved in operations at Site 300 are not set forth in a formal document.

CONCERN: See Concerns OA.1-3, OA.1-5, and OA.6-1.

FINDINGS:

- o Although Chapter 2, "Work Planning and Safety Procedures," of the LLNL Health and Safety Manual, M-010, January 1990, provides general information on formal documentation, it does not provide definitive guidance to ensure a consistent system of formal administrative controls for operations throughout LLNL.
- o As determined from discussions with operations managers and safety officers in several LLNL divisions, there is no specific definition of the hierarchy of administrative controls (SARs, OSRs, procedures) in effect at LLNL to meet requirements of DOE 5480.5 or DOE 5481.1B. There is also no definition of measures that must be taken if an administrative control is violated.
- o A survey of LLNL SARs (See Section OA.7) revealed that some (e.g., the SAR for the Metals Production Line in Bldg. 332) are not current with respect to up-to-date information or format; others are not available (e.g., the SAR for Bldg. 331 operations is in preparation but long overdue).

- Examination of the existing LLNL SARs showed that the OSRs cited therein are often dissimilar in format. The OSRs in the SAR for the LLNL Plutonium Facility follow the format stipulated in SAN MD 5481.1A; while those in the Final Safety Analysis Document for DOE Comment for the MOCVD Crystal Growth Facility in Building 166 (January 30, 1990) follow a general format without the structure cited in SAN MD 5481.1A.

- Examination of the wide variety of procedures used by personnel in different LLNL divisions indicated that:

  - Facility Safety Procedures (FSPs) vary widely in scope. Facility Safety Procedure 1000 for the Laser Complex (January 3, 1990) is primarily a policy document; whereas Facility Safety Procedure 151 (Rev. January 1990) provides great detail about all operations in Nuclear Chemistry Division Bldg. 151.

  - Operational Safety Procedures (OSPs) in different LLNL divisions are often dissimilar in character. OSPs in the Laser Programs (e.g., those in FSP-391) are general in scope with primary emphasis on hazards analysis and derivative controls; OSPs for Bldg. 332 operations are broad in scope and very detailed. Moreover, in the Nuclear Chemistry Division, OSPs are prepared only for those operations that are outside the limits established by their FSPs.

  - Operations in the Nuclear Chemistry Division Bldg. 151 are performed according to procedures written by technical professionals; but these procedures are not registered, in the sense that they are not normally numbered, dated, or signed. Furthermore, they are not in any system that formally requires review for continued validity on a periodic schedule.

- Incident reporting practices for operations vary throughout LLNL. Although Chapter 4 of the LLNL Health and Safety Manual, M-010, January 1990, cites requirements for notification of accidents or incidents, it does not stipulate preparation of "unusual event" reports; nor does it specify the review process that could escalate the event to an Unusual Occurrence for treatment under the requirements of DOE 5000.3.

- See Concerns OA.1-1, OA.7-1, and QV.1-1; and Sections FR.3 and TS.2.

CONCERN: (OP.1-2) (H2/C1) Formal administrative controls for operations are not consistent in the way they are provided, applied, enforced, and monitored throughout LLNL; nor do they conform completely to the format specified in SAN MD 5481.1A.

FINDINGS:

- o No safety performance goals are established for the operations groups at LLNL.
- o With a few exceptions, safety performance is not a defined segment of the annual performance appraisal.
- o See Concerns OA.3-1, OA.6-1, IH.3-1, and QV.1-2.

CONCERN: (OP.1-3) (H3/C2) There is no sitewide requirement to address safety performance as part of the annual performance appraisal within the operating divisions at LLNL.

OP.2 CONDUCT OF OPERATIONS

PERFORMANCE OBJECTIVE: Operational activities should be conducted in a manner that achieves safe and reliable operation.

FINDINGS:

- The on-the-job training of Site 300 operators varies from facility to facility and is primarily left to the discretion of the facility supervisor.
- In most cases, the on-the-job training of operators is informal and proceeds without preestablished checklists or guidelines.
- There are no written policies for the various Site 300 facilities directing how trainees may be used to support operations. This decision is left to individual supervisors.

CONCERN: See Concern TC.1-1.

FINDINGS:

- The Engineering Sciences Division has a requirement that, in order to maintain their skills and familiarity with equipment and procedures, qualified radiographers/HE handlers who are to be utilized as replacements at Site 300 nondestructive evaluation (NDE) facilities shall be assigned to the site a minimum of 1 day of work every 60 days. This requirement is not being adhered to.
- In the absence of the NDE Facility Associate, who normally is the only Engineering Sciences Division qualified radiographer/HE handler at Site 300, a replacement would have to be sent from the LLNL main site. Records showed that there is no qualified replacement who has had recent and frequent exposure to Site 300 NDE operations.

CONCERN: (OP.2-1) (H2/C2) No document includes procedures and guidelines covering the maintenance of skills of operators assigned to the various Site 300 facilities.

OP.3 OPERATIONS PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Approved written policies, procedures and data sheets should provide effective guidance for normal and abnormal operation of each facility on a site.

FINDINGS:

- o The Site 300 Process Area Procedures (Nos. 205-228) are not being reviewed annually, as stated within these procedures.
- o Site 300 policies and procedures do not clearly define the many interfaces to be encountered in the matrixed management structure employed by LLNL.
- o As a rule, LLNL main site managers do not play a significant role in ensuring compliance with policies and procedures that govern the operations at Site 300 for which they are responsible.
- o OSP No. 191.14, Chemical Synthesis, does not state that the Peer Review Committee at LLNL functions as the Explosives Development Committee in approving synthesis and scaleup of new explosives. DOE/EV/06194, DOE Explosives Safety Manual, gives the procedures and requirements for approving an explosives development program by an Explosives Development Committee.

CONCERN: (OP.3-1) (H2/C2) Documentation does not demonstrate that the policies and procedures governing operations at Site 300 and the High Explosives Applications Facility (HEAF, Bldg. 191) facilities are strictly adhered to.

FINDINGS:

- o There is no recovery plan for Site 300 delineating steps to be followed in the event of an incident on, at, or near a firing table during or following a firing operation.
- o Procedures governing the operation of explosive experiments do not cover steps to be followed when unexpended energetic materials are to be intentionally left on the firing table.
- o There is no OSP covering steps to be taken if an equipment malfunction (e.g., in the control instrumentation) occurs at a firing facility after a firing sequence has been initiated.
- o Video coverage of the firing table area at Bunker 801 does not completely support the muster control system, nor does it allow a thorough post-shot inspection of the area around the firing table.

CONCERN: (OP.3-2) (H1/C2) Existing procedures and equipment do not effectively guide or support the Site 300 operations staff when unusual or abnormal situations are encountered.

FINDINGS:

- o OSP No. 801-900215 was prepared to cover the destruction in place of the damaged unit from Shot 1804M at Site 300 Bldg. 801 because movement of the unit was considered an unacceptable risk. This OSP did not require that a radiographic operation be

performed on the unit, because it was considered that this operation was covered by FSP No. 134, Nondestructive Field Radiography - Site 300.

- o Section 2 of the LLNL Health and Safety Manual states that "a safety procedure is probably required" for "any activity that is not in compliance with a mandatory code or standard of an existing safety policy."

- o See Section PT.3.

CONCERN: (OP.3-3) (H1/C2) Not all policies defining activities that require Facility Safety or Operational Safety Procedures may be sufficiently specific to cover all hazardous operations at Site 300.

FINDINGS:

- o Operations at the various Site 300 facilities do not generally follow a preestablished, step-by-step sequence.

- o Often procedures are based on the knowledge and experience of involved personnel rather than on a written checklist. For example, at Bunker 851 in February 1990, an incident at the grounding panel led to the inadvertent firing of the capacitor discharge unit.

CONCERN: (OP.3-4) (H1/C2) The safe conduct of routinely performed, normal operations at Site 300 is not always ensured or guided by formal mechanisms such as written checklists.

FINDINGS:

- o Unusual Occurrence Report (UOR) LLNL-89-23-B-331 cited the causes of a 180 to 300 Ci tritium release as "Personnel" and "Procedure." The operator who generated the UOR stated there was no procedure to cover the operation in question.

- o UOR LLNL-85-3-Bldg. 331 cited "Procedure" as the reason for the release of 900 Ci of tritium.

- o Eighty Ci of tritium were released in Bldg. 331, Room 135, on November 1, 1989; no procedures were used.

- o Five rooms (130, 149, 153, 157, and 158) in Bldg. 331 can employ in excess of 1 kCi of tritium in normal experimental operations. A limit for operating without review by the Facility Manager and Hazards Control is 1 kCi according to the Facility Safety Procedure.

- o There is a program underway in Bldg. 331 to assess the number of Curies, the total gas quantity, the pressure, and which systems are being used, as the criteria related to the need for formal procedures.

CONCERN: (OP.3-5) (H2/C2) The LLNL program to improve the criteria for mandating the use of approved procedures in Bldg. 331 is not yet implemented.

OP.4 FACILITY STATUS CONTROLS

PERFORMANCE OBJECTIVE: Operations personnel should know the status of the systems and equipment under their control, should know the effect of nonoperational systems and equipment on continued operations. They should ensure that systems and equipment are controlled in a manner that supports safe and reliable operation.

FINDINGS:

- Health and Safety Manual Supplement 26.13, General Lock and Tag Procedure, revised June 27, 1984, does not require annual inspection and certification of energy controls in accordance with 29 CFR 1910.147. It also does not address training of employees as required by the OSHA standard.
- Supervisors and employees at Site 300 were generally unaware that the locks and tags in their facilities should be periodically inspected and that employees should be trained in the use of locks and tags.
- A lock and tag was found on a circuit breaker that was associated with a piece of equipment removed a number of years ago.

CONCERN: (OP.4-1) (H2/C1) Health and Safety Manual Supplement 26.13, General Lock and Tag Procedure, revised June 27, 1984, does not comply with the provisions of 29 CFR 1910.147 for use of locks and tags.

OP.5 OPERATIONS STATIONS AND EQUIPMENT

PERFORMANCE OBJECTIVE: Operations stations and facility equipment should effectively support facility operation.

FINDINGS:

- o Possible ignition sources were located inside a chemistry hood in the HEAF.
- o Interlocked access doors were not provided to Rooms 1314 and 1316 at HEAF, areas where remotely controlled explosive operations are conducted.
- o At a number of Site 300 facilities (Bldgs. 834E, 834J, 854H, and 854J) electric lines servicing the facilities are not installed underground from a point not less than 50 feet away.
- o At several Site 300 explosives facilities, including Bldgs. 817 and 827, overhead lines required to be in proximity to the buildings are closer than the length of the poles supporting the lines, so that a broken energized line could come into contact with the building.
- o The lettering on explosives and personnel limits signs in Bldgs. 341 and 345 was small and difficult to read. At least one room appeared to have approval for both a 500 and a 600 gram limit.
- o The penetration hole around the conduit pass-through in the reinforced concrete dividing wall between the Propellant Work Room 1618 and the Loading Dock at HEAF had not been filled with cement grout.
- o See Section AX.6.

CONCERN: (OP.5-1) (H2/C2) Not all explosives operations strictly comply with the provisions of DOE/EV/06194, DOE Explosive Safety Manual, with respect to items such as electrical line routing, personnel access controls, and ignition sources.

FINDING:

- o An explosives storage cubicle in Bldg. 229 was not provided with a steel plate and sand bag barrier to suppress missiles (hazardous fragments and debris) that would be projected from the building in the event of an accidental explosion in the storage cubicle as recommended by the 1985 Department of Defense Explosives Safety Board Inspection Team.

CONCERN: (OP.5-2) (H2/C2) One storage cubicle in Bldg. 229 did not have a barrier to suppress missiles from escaping the magazine, as recommended by a Department of Defense Explosives Safety Inspection Team in 1985.

OP.6 OPERATOR KNOWLEDGE AND PERFORMANCE

PERFORMANCE OBJECTIVE: Operator knowledge and performance should support safe and reliable operation of the equipment and systems for which they are responsible.

FINDINGS:

- o In many cases, employees do not receive safety-related feedback regarding their and other work units' injury types, frequencies, and other specifics at LLNL.
- o Little if any effective use is made of industry "lessons learned" (UORs and other DOE accident reports and bulletins), as most workers profess never having seen such information.
- o Many of the operators interviewed stated that they attend safety meetings only two or three times a year.
- o See Concerns OA.5-3 and TC.1-1 and Section PT.2 and FR.6.

CONCERN: (OP.6-1) (H2/C2) Safety-related information (unusual occurrence reports, lessons learned, and documented safety meetings) does not reach the operating staffs in a consistent or effective manner at LLNL.

OP.8 HUMAN FACTORS

PERFORMANCE OBJECTIVE: Human factors considerations should be incorporated in the design, layout, and operation of all facilities on the site in order to facilitate operator control, information processing, and the recognition and proper response to alarms, instruments, and other equipment.

FINDINGS:

- o Labels and notes in Site 300 control rooms are frequently presented on "Post-it" note pads or stuck up by other means that are as easily dislodged.
- o An approval system for the use of operating aids was not apparent.
- o Not all operating aids were dated.

CONCERN: (OP.8-1) (H2/C2) A policy governing the approval and posting of operating aids in control rooms does not exist.

FINDINGS:

- o Discussions with LLNL operations managers indicated that, with few exceptions, human factors engineering has not been considered in design, operations, and maintenance of LLNL facilities, as required by DOE 6430.1A, General Design Criteria, Section 1300-12 (April 6, 1989) for nonreactor nuclear facilities.
- o Despite the fact that DOE 6430.1A, Section 1300-12.3.2 stipulates that "A human factors engineering program plan appropriate to the level of importance of a facility or system shall be developed during the system development process (i.e., as an integral part of the conceptual design phase)," the manager of the LLNL Systems and Human Performance group reported that except for the Engineering Demonstration System (EDS) project, this requirement has not been met at LLNL.
- o The Systems and Human Performance group in the LLNL Nuclear Systems Safety Program organization has three engineers (in a group of seven) specifically trained in the field of human factors engineering; however, as determined through discussions with this group's manager, over 90 percent of their services is provided to agencies external to LLNL (e.g., the Federal Aviation Administration, the Nuclear Regulatory Commission, the Office of the Secretary of Defense, the U.S. Army, and the U.S. Navy).
- o The Human Factors Engineering services from the Systems and Human Performance group were curtailed for the EDS project before the facility was started up. As a result, the Program Manager for Systems and Human Performance has never observed performance of the human factors measures that were incorporated into the design and construction of the EDS.

CONCERN: (OP.8-2) (H2/C1) LLNL has no requirement for the inclusion of human factors engineering in the design, layout, and operations of facilities, as required by DOE 6430.1A, Section 1300-12 for nonreactor nuclear facilities.

D. MAINTENANCE

This Appraisal included all eight Performance Objectives in the Maintenance area. The maintenance programs at Site 300 were evaluated primarily through interviews with both managers and technicians of various divisions; physical inspection of test, fabrication, and support-shop facilities; and review of directives and equipment records. The principal organizations at Site 300 that were reviewed were the Plant Engineering and Fabrication Divisions, but vehicle and electronics maintenance supervisors were also interviewed. The maintenance programs at the LLNL main site were evaluated through interviews and tours with managers and technicians of the Maintenance/Operations Department and its supporting divisions, and with managers and support personnel at Bldgs. 165, 194, 251, 298, 321, 332, 334, 343, 492, 511, 513, 514, 519, and 612. At these buildings, maintenance manuals, maintenance procedures, maintenance historical information, vendor manuals, and organizational policy manuals were reviewed, and inspections were made of buildings, utilities, and programmatic equipment.

In addition, sitewide inspections were conducted of the LLNL main site electrical distribution system as well as the potable water system, the low-conductivity water system, the natural gas system, and the compressed air system. The DOE SAN office in Oakland, California, was also visited.

Maintenance at Site 300 is inconsistent; adequate in some areas but quite weak in others. Weaknesses result primarily from a lack of appreciation of the different elements involved with maintenance and a lack of formal administration of maintenance activities. Maintenance administration activities must include effective training and qualification programs, areas where additional weaknesses were found.

Throughout the LLNL main site, maintenance, as measured by the condition of buildings and utilities at this point in time, was found to range from poor to fair. It is recognized that the maintenance program at LLNL has been underfunded for a number of years. It is also recognized that the maintenance organization has in place an aggressive program to return the LLNL main site to a more acceptable condition. However, at the time of this Appraisal, the general condition of the LLNL main site buildings and utilities was considered to be substandard. The support provided by management, and the efforts of the LLNL main site Maintenance/Operations Department in organizing and redirecting their efforts to recover from the past period of de-emphasis on maintenance, was considered to be motion in the right direction. As part of this activity, documentation describing the Maintenance/Operations Department, including the organizational structure, responsibilities, and interfaces, is being developed but is incomplete at this time. These relationships are generally well understood; however, backup documentation is required. In addition, DOE 4330.4, Real Property Maintenance Management, requires LLNL to develop, publish and implement a Real Property Maintenance Management Program. Most of the elements of this program are in place, but overall policy documentation establishing and clearly defining this program is incomplete.

Systems and equipment under the control of the programs were also examined from the standpoint of maintenance. In these cases, maintenance, as indicated by the condition of the equipment, varied greatly from poor to excellent primarily according to the age of the particular system and the vitality of the program budget. Maintenance on equipment of this nature is much less

formal, with a high level of reliance placed on the cognizant scientist or technician rather than on formalized procedures. The Appraisal Team considered that there was an imbalance here and that policies and procedures should be put in place to increase formality and control.

Some problems were noted in the interface between program activities and maintenance. Instances were noted where program equipment was developed without timely involvement with the maintenance organization to incorporate basic maintenance requirements. In other instances, programmatic equipment which should logically be maintained by the plant maintenance organization was not included in their system.

Maintenance activities involve preventive as well as corrective elements. Of these two elements, preventive maintenance includes the two sub-elements of routine upkeep (for operability) and general preservation of equipment and facilities. The principal criticism about routine upkeep preventive maintenance is that the checklists used for some of the fabrication equipment do not reflect all of the manufacturer's recommendations contained in the associated technical manuals. At both Site 300 and the LLNL main site, the vendor technical documentation was generally available to maintenance personnel. Nevertheless, this documentation was found not to be consistently considered or incorporated into the preventive maintenance program. In addition to missing some of the steps recommended by the manufacturer, preventive maintenance activities are often accomplished by the use of generic checklists that only provide a "tickler" for the repair person consisting of a place to check off the associated activities which might apply and a place to sign for the completion of the job. The checklists are neither component-specific nor expanded to include procedural steps or cautions which might be appropriate to the specific activities or systems applicable to the component.

The principal maintenance problem at Site 300 and to some extent, the main site, however, is the apparent lack of a systematic program for facility and system preservation, the other sub-element of preventive maintenance. A number of components are located in the open environment, exposed to the corrosive effects of the weather. Even equipment that is located inside LLNL buildings, however, is often neglected in terms of preservation. Many valves in systems such as the water supplies to the various buildings and services have been allowed to deteriorate. While it may sometimes be more cost effective to simply replace valves than to maintain them, from an operational and safety perspective, water supplies to the various buildings necessary for safety or sanitary purposes should always be available and reliable.

The second major element of maintenance, repair, also contains two sub-elements, predictive and corrective. Predictive maintenance is essentially not applicable to Site 300, since it is cost-effective primarily for relatively large rotating machinery found at facilities such as power plants. Corrective maintenance is thus the principal repair function performed at Site 300. The LLNL main site does include an extremely large number of rotating equipment items including, primarily, pumps and blowers; therefore, a predictive maintenance program emphasizing vibrational analysis is being initiated.

Corrective maintenance is primarily performed under the work request, or Whiz Tag System, which is based only on a single criterion, the amount of the time required for the repair person to do the job. The initial time estimate is sometimes made by a client who really does not know what is involved with the work, so the time criterion (8 or 16 hours, depending upon which document consulted) is considered to be flexible. The maintenance activities undertaken through the Whiz Tag System do not have a level of control that ensures compliance with either safety procedures or applicable technical manuals, and generally have no quality control checkpoints or design adequacy checks. However, in surveying over 100 recent Whiz Tag actions, all were found to be of a "housekeeping" nature with no safety implications.

MA.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Maintenance organization and administration should ensure effective implementation and control of maintenance activities.

FINDING:

- The responsibilities and authorities of each position within the Site 300 Plant Engineering organization are not documented or well defined. At the LLNL main site, documentation describing the Maintenance/Operations Department including the organizational structure, responsibilities, and interfaces is in the process of being prepared; however, it is incomplete at this time. No schedule for completion was noted. (See Section OA.6.)

CONCERN: See Concern OA.6-4.

FINDINGS:

- Although a Plant Engineering Policy manual exists, the manual does not address maintenance policy. The section on maintenance is limited to a list of implemented maintenance programs.

- Although a Plant Engineering Standards manual exists, it is primarily intended for procurement activities. No formal guidance is provided on standards of cleanliness and preservation of equipment.

- There is no formal document control system for technical manuals.

- Maintenance management presence and oversight at Site 300 are not systematically used to ensure the proper performance of maintenance tasks. The geographical separation of the various buildings at Site 300 makes it difficult for supervisors to ensure that maintenance is performed properly.

- Organizational responsibility has not been assigned to inspect and maintain the trailers used in transporting hazardous wastes. Vehicles used for onsite transportation of hazardous wastes are not maintained in accordance with Federal regulations. (See Section PT.8.)

CONCERN: (MA.1-1) (H3/C2) Organizational documentation needed for an effective maintenance program is not complete since not all equipment is covered and maintenance is not systematically controlled in accordance with technical manuals.

FINDINGS:

- Training of maintenance personnel is not formal, so it is difficult to determine whether personnel are qualified to perform assigned tasks.

- Maintenance personnel are not formally task qualified to perform work. Most training is conducted on the job. The potential need for offsite vendor training is not systematically considered. Plant Engineering and Maintenance Operations has a good apprenticeship program, but ongoing training for journeymen, other than for safety courses, is not established.

A training plan document did not exist but was being developed.

- Training and qualification programs are not in place to ensure that vacancies are filled with qualified personnel.

- See Sections TC.5 and OA.6.

CONCERN: See Concern TC.1-1.

FINDINGS:

- DOE 4330.4, Real Property Maintenance Management, March 25, 1982, stipulates developing, publishing, and implementing a real property management plan. While the LLNL main site Maintenance/ Operations Department has incorporated and employs most of these required elements, an overall policy implementing the requirements of this Order and describing responsibilities, control measures, and format is not in place.

- The LLNL is not contractually required to conform to the requirements of DOE 4330.4.

CONCERN: (MA.1-2) (H3/C2) Conformance to DOE 4330.4 is not fully in effect and is not currently a contractual requirement.

FINDINGS:

- A formalized system for conducting maintenance of plant buildings and utilities is in place; however, a similar system with regard to the maintenance of program equipment and experimental systems is not in place. A policy or procedures for establishing such a system is not evident.

- A high level of reliance is placed on the experience, knowledge, integrity, and availability of technicians, mechanics, and experimenters in conducting maintenance activities on programmatic or experimental equipment.

- Maintenance requirements and procedures for programmatic equipment, in most cases does not exist. Maintenance information is given (primarily) by vendor manuals which serve as the information source for troubleshooting. In general, corrective maintenance is done when equipment fails, or when a degradation of performance is noted.

- LLNL stresses the high quality of LLNL personnel and the need for a feeling of ownership and contribution on the part of their employees rather than a reliance on detailed procedures.

- The Appraisal Team noted that, in many key positions, technical personnel have left or are nearing retirement, with no clear means evident to transfer their knowledge.

- See Concern OA.1-3 and Sections PT. 1 and OA.5.

CONCERN: (MA.1-3) (H2/C2) The heavy reliance on the skills of personnel to ensure proper maintenance and the assurance of continuity of talents is not sufficiently balanced by formally documented procedures.

FINDINGS:

- o The budget for plant maintenance has decreased progressively for about 8 years and this decrease has only been reversed for the last 2 years. As a consequence, many of the plant buildings and utilities are in a general state of disrepair. This is indicated by: numerous structures needing paint; rusty components; missing, loose, or otherwise faulty fasteners; leaks; unmarked pipes; missing insulation; and deteriorated wooden structures. Goals for recovery actions and for an adequate budget are being put in place.

- o The programs have traditionally demonstrated reluctance to provide sufficient resources to ensure proper maintenance for buildings and structures.

CONCERN: (MA.1-4) (H2/C2) The plant and utilities, particularly the older portions, have deteriorated to the extent that a major recovery effort is necessary.

FINDINGS:

- o Cooperation between the programs at the LLNL main site and the maintenance organization has been deficient in several aspects. Instances were noted where:

  - Programmatic equipment has been procured or fabricated without detailed interfacing with maintenance to ensure that maintenance requirements are incorporated in a timely and complete fashion.

  - Programmatic equipment such as tank trailers which logically should be on the routine preventive maintenance program are, in some cases, not included and are maintained on an "as-required" basis.

  - Outages for maintenance are occasionally deferred excessively due to programmatic requirements.

- o Numerous small satellite machine shops were noted. Maintenance and control of these operations is an added complication, and there is no means to ensure that this equipment will automatically be placed in the maintenance system.

- o See Concern OA.1-1.

CONCERN: (MA.1-5) (H2/C2) No policy is in place to ensure that basic maintenance requirements are given the required emphasis and priority with respect to programmatic activities.

MA.2 CONDUCT OF MAINTENANCE

PERFORMANCE OBJECTIVE: Maintenance should be conducted in a safe and effective manner to support each facility and operation on the site.

FINDINGS:

- The informal work requests used in the Whiz Tag System at Site 300 do not specifically require consideration of codes and standards, safety precautions, or design changes and documentation. It effectively supports expeditious accomplishment of priority work, but relies on the individual worker to ensure safety.
- The Whiz Tag System does not provide safety precautions and supervisory check points; however, a review of several hundred recent Whiz Tag actions revealed only minor housekeeping-type activities which had no safety implications.
- See Sections MA.4, FR.2, and FP.7.

CONCERN: (MA.2-1) (H1/C2) CAT. II — In general, the Whiz Tag System does not contain guidance, criteria, and controls to ensure safe conduct of maintenance of plant systems and facilities nor control of safety system design features.

FINDINGS:

- Written procedures are not used to govern maintenance activities. Maintenance personnel refer to technical manuals for detailed information, but these manuals contain no site-specific information such as multiple power supplies or local modifications.
- Preventive maintenance procedures are listed and controlled by a computerized system which identifies the equipment, the procedure, and the maintenance period. This is an effective accounting tool, but the procedures are largely general checklists with very little requirement for quantitative information, checkpoints, or references to other more detailed procedures. Checklist-type procedures of this sort are generally satisfactory for simple systems but are not satisfactory for more complex or highly critical systems.
- Maintenance personnel are not informed in a systematic way of lessons learned from past experience.
- Lock and tag procedures are sufficient for most maintenance operations but are not independently verified or centrally managed as a means to control plant status. This results, for example, in the potential for safety-related systems (announcing systems and warning lights) to be de-energized at buildings that are not currently in operation, although deactivated facilities may require the presence of workers for non-process-related activities.
- See Section MA.8 and Concern OA.5-3.

CONCERN: (MA.2-2) (H3/C2) Maintenance procedures do not provide detailed guidance for maintenance activities.

FINDINGS:

- o Some buildings have holes or openings in exterior walls which appear to result from incomplete restoration following the removal of pipes and cables or from failure to provide an appropriate seal during initial installation.
- o A program for systematic preservation of valves and piping systems has not been established.
- o See Sections MA.5, AX.1, and AX.6.

CONCERN: (MA.2-3) (H3/C2) In some areas, building-specific responsibility for identifying and correcting preservation and maintenance problems is not clearly assigned and does not effectively support building systems such as water, gas, and electric utilities.

FINDINGS:

- o Maintenance procedures for programmatic equipment are rarely in evidence and in many instances they may not be required, but there is no indication that vendor information, engineering designs, or good practice have been examined to verify this and/or to generate procedures accordingly.
- o Procedures for periodic calibration of test instruments, particularly oscilloscopes are not uniform. Much uncertainty was noted with respect to whether or not an oscilloscope was in, or even required, calibration.
- o Essentially all calibration stickers noted were out-of-date.
- o See Concerns QV.4-1, OA.1-1, and RP.8-1.

CONCERN: (MA.2-4) (H2/C2) A policy establishing basic guidelines for maintenance and calibration of key programmatic equipment and instrumentation is lacking.

MA.3 MAINTENANCE FACILITY EQUIPMENT AND MATERIAL

PERFORMANCE OBJECTIVE: Facilities, equipment, and material should effectively support the performance of maintenance activities.

FINDINGS:

- o Maintenance activities are performed at individual building and site locations with primary shop support provided by multiple craft shops at Bldgs. 511 and 519. Internal portions of Bldg. 511 are in the process of being rearranged to obtain more efficient usage of the area and, as a result, some expected disorder was noted. However, Bldg. 511 is in a serious state of disrepair. The outer surface requires painting, the main shop's floor is pitted, and the internal wiring is draped on the walls in a disorderly fashion.

- o A faulty bridge crane was noted in Bldg. 511. This unit required corrective maintenance, and was not tagged out.

CONCERN: (MA.3-1) (H2/C2) The LLNL main maintenance shop, Bldg. 511, is in a poor state of repair.

FINDINGS:

- o Machine tools around the main site are maintained out of the Materials Fabrication Shop, Bldg. 321. Maintenance consists of routine machine oiling and checking of belts. Maintenance personnel expressed some degree of frustration over insufficient resources and lack of access to key machine tools for maintenance due to programmatic pressures.

- o Excessive oil leakage was noted at several locations.

- o Numerous machine tools were observed at various satellite shops in the program areas. Concern was expressed that there were no positive mechanisms to determine whether all of these machines were under the cognizance of the Bldg. 321 maintenance program.

CONCERN: (MA.3-2) (H3/C2) There is no mechanism to ensure that all machine tools are included in the centralized machine tool maintenance program.

MA.4 PLANNING, SCHEDULING, AND WORK CONTROL

PERFORMANCE OBJECTIVE: The planning, scheduling, and control of work should ensure that identified maintenance actions are properly completed in a safe, timely, and effective manner.

FINDINGS:

- o There is only one formal criterion for accomplishing work under the Whiz Tag System. The criterion involves the number of hours required to accomplish the work, but it is not clear if the criterion is 8 or 16 hours since it appears in the plant documentation with both time limits. Whiz Tags are scheduled on the basis of priority.

- o A lack of coordination and planning reduces the effectiveness of routine maintenance requested through the Whiz Tag System. For example, job requests for piping work or welding are sometimes not followed with or coordinated with a work request for repainting or preserving the affected work area. Also, the need for post-repair testing and inspection may not be identified.

- o The Whiz Tag System does not specifically require consideration of safety precautions or design changes and documentation. It effectively supports expeditious accomplishment of priority work, but relies on the individual worker to ensure safety.

- o "Work packages" and procedures are not used in most maintenance activities, so safety and control points are not necessarily incorporated into the work. An exception to this is in Bldgs. 332, 331, and 251, where such controls are being put in place. Likewise, post-maintenance test requirements or procedures are not formally required or documented. Exceptions to this occur in Bldg. 332 and in the high-voltage distribution system.

- o Maintenance supervisors at Site 300 do not routinely monitor work in progress.

- o Documented maintenance procedures that include all of the necessary information and coordination requirements are not routinely used at Site 300.

- o See Section FP.7.

CONCERN: See Concern MA.2-1.

FINDINGS:

- o Scheduling for preventive maintenance is conducted using a computerized program which lists all maintenance items, associated procedures, and frequency of maintenance. This is an effective bookkeeping system but incorporates very little in the way of technical guidance, procedure review and control, and independent overview.

- o Job planning and scheduling, employing Whiz Tags, rely heavily on the individual craftsperson to be knowledgeable with respect both to maintenance procedures and to interfacing with facility operational and hazards control personnel.

- o Planning and scheduling for maintenance of programmatic equipment is the responsibility of the program, although plant maintenance personnel are occasionally employed for these tasks. Some tasks such as maintenance of vacuum pumps are done on a routine basis, but normally maintenance is done as required due to failure or degradation of performance.

- o See Section FR.2 and Concern OA.5-3.

CONCERN: (MA.4-1) (H3/C2) Informal maintenance procedures impact maintenance planning and work control.

MA.5 CORRECTIVE MAINTENANCE

PERFORMANCE OBJECTIVE: The material condition of components and equipment should be maintained to support safe and effective operation of all facilities on the site.

FINDINGS:

- o Repair of fluid system leaks and preservation of flanges and valves where leakage has occurred is not routinely accomplished at Site 300, resulting in the need for increased corrective maintenance.
- o Corrective maintenance work at Site 300 is generally reactive to operational requirements. Repair of exterior walls to close holes, for example, is not normally requested or undertaken.
- o Numerous instances of poor maintenance were noted at the LLNL main site, including deteriorated paint, rust, loose or unsecured fasteners, unsecured panels, missing insulation, unmarked pipes, burned-out indicator lights, low oil level (one case), out-of-date notes on operating panels, out-of-date calibration or set point dates, loose wiring, and loose gasket materials.
- o See Concern MA.2-3.

CONCERN: (MA.5-1) (H2/C2) A high level of corrective maintenance to buildings and utilities is not evident at LLNL.

FINDINGS:

- o Corrective maintenance to programmatic equipment is done as requested on the basis of equipment failure or deterioration of performance.
- o The condition of individual programmatic equipment and systems was found to be largely dependent upon the age of the system. In the case of older equipment, significant outstanding corrective maintenance issues were noted including coolant leakage, oil leakage, and excessive rust.
- o Experimental systems nearing the end of their funding support or programmatic usefulness are seriously neglected from a maintenance standpoint.

CONCERN: (MA.5-2) (H2/C2) Older experimental systems do not receive the required level of corrective maintenance to ensure safe and efficient operations.

MA.6 PREVENTIVE MAINTENANCE

PERFORMANCE OBJECTIVE: Preventive maintenance should contribute to optimum performance and reliability of systems and equipment important to operations.

FINDINGS:

- o Preventive maintenance is not necessarily performed in accordance with vendor recommendations.
- o Preventive maintenance is controlled and scheduled by a sitewide computerized system which effectively tracks these activities; however, preventive maintenance activities are not component specific. Generic checklists include items that do not apply to the specific equipment being maintained, so the worker must interpret the checklist based on experience and informal training.
- o Preventive maintenance procedures for critical equipment do not incorporate sufficient hold or checkpoints for independent review or verification.
- o See Concern OA.5-3.

CONCERN: (MA.6-1) (H3/C2) Preventive maintenance activities have not been optimized with vendor recommendations or with locally generated, component-specific procedures or checklists.

MA.7 PREDICTIVE MAINTENANCE

PERFORMANCE OBJECTIVE: Maintenance history evaluation and systematic root cause analyses should be used to support maintenance activities and optimize equipment performance.

FINDINGS:

- o A predictive maintenance program is in the planning stages which will include vibration analysis, oil analysis, infrared scanning, and ultrasonic scanning.
- o Vibration instrumentation has been installed in several facilities and is operational. Installation in all candidate facilities and installation of other preventive maintenance techniques have not been completed.
- o See Concern OA.5-5 and Section TS.4.

CONCERN: (MA.7-1) (H3/C2) A predictive maintenance program is not fully in place, and overall planning, scheduling, and budgeting have not been completed in sufficient detail to evaluate the planned program and its associated goals.

MA.8 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Maintenance procedures and related documents should provide appropriate directions and guidance for work and should be used to ensure that maintenance is performed safely and effectively.

FINDINGS:

- o Detailed maintenance or repair procedures are not routinely used. Checklists used in preventive maintenance are often generic for a particular type of equipment and do not include safety precautions or quality assurance checkpoints.

- o Field observations indicated that, in some instances, checklists are not used properly. That is, individual items are not necessarily done in the prescribed order, and each action is not necessarily checked off after completion. The lists provide guidance but little independent or backup assurance that each step is accomplished.

- o No group was identified as having the responsibility and special expertise or training in the preparation of maintenance procedures.

- o No policy exists regarding the preparation, control, and use of maintenance procedures.

- o Maintenance and equipment-record storage is carried out by the Maintenance/Operations Department. No consistent system to accomplish this was noted at the various program areas.

- o See Concern MA.2-2.

CONCERN: (MA.8-1) (H2/C2) At essentially all program areas examined, formal maintenance procedures for programmatic equipment are not employed.

E. TRAINING AND CERTIFICATION

This Appraisal addressed 10 of the 11 Training and Certification Performance Objectives; Reactor Operations was not applicable to LLNL. The appraisal was conducted through interviews with personnel in the Hazards Control Department with training responsibilities, as well as supervisory, professional, and operations staff at the LLNL main site and at Site 300. The Bldgs. 801, 805, 817, 827, 851, and 875 were visited at Site 300. LLNL main site interviews were held at Hazards Control, Human Resources, Plant Engineering, HEAF, Plutonium Facility, Tritium Facility, Heavy Elements Facility, Emergency Preparedness Training, Security Protective Forces, Fire Department, Laser Programs, and the Nondestructive Evaluation (NDE) Group at Bldg. 327. Three safety-related training presentations and an emergency drill at the Bldg. 251 Heavy Elements Facility were observed. A review of relevant training documentation and records was made throughout the appraisal. Personnel at LLNL exhibited a genuine concern for safety, but several weaknesses were identified in the area of training.

Facility supervisors are responsible for seeing that all personnel in their facilities are appropriately trained. Formal, well-documented courses are taught by the Hazards Control Department. Management must initiate the request for personnel to attend these courses. On-the-job training (OJT) under the tutelage of experienced, qualified operators or by facility supervisors provides specific instruction to employees new to areas or operations. However, OJT at LLNL is deficient in documenting established training programs and plans and in evaluating employee performance for job-specific tasks. Graded exams to determine employee qualifications are being used in some areas, but in many cases they are nonexistent.

Training and qualification/certification requirements are not formally established for all assigned job tasks. Those requirements that do exist are not always established on a systematic basis sitewide. There is neither a policy and procedures manual nor a corporate standard for training. As a result there is considerable variability in each training activity and the way in which training is administered in different areas and by different supervisors. Trainee evaluation techniques and methods vary widely across LLNL and in many cases do not exist.

The Appraisal Team found the training program at Site 300 for employees who handle high explosives (HE) to be of high quality. The supervisory personnel interviewed by the Appraisal Team in the Site 300 Process Area, Chemistry and Formulation Areas, and Bldg. 801 maintained good employee training records and had documented training requirements for each employee. Operators and technicians interviewed in the above areas and in the HEAF facility indicated that they had received required training and demonstrated a good level of knowledge of safety.

There are no requirements, standards, documentation, or formal training program for Site 300 Maintenance personnel. The Appraisal Team found that the Quality Control Inspector training at Site 300 was nonexistent, except for that related to HE components, which was quite good.

All of the supervisory personnel at Site 300 interviewed accepted their responsibility for training. All of the supervisors involved in HE work (e.g., the Process Area Manager, the Chemistry and Formulation Supervisor, the

Bldg. 801 Facility Manager, the Bldg. 851 Facility Manager, and the HEAF Manager) demonstrated basic management skills. The records examined for these supervisors indicated that some limited management training was received in addition to technical and safety training.

The training courses observed at the main site by the Appraisal Team were effectively presented. Instructors were technically competent and displayed good instructional techniques. The training facilities and equipment at LLNL main site were sufficient. The Plutonium Facility (Bldg. 332) had significantly improved its training program since the Technical Safety Appraisal of November 1986. The Facility Training Officer has established an effective safety training program to meet DOE requirements. Documentation of training records is kept current on a training database. The Tritium Facility (Bldg. 331) issued a revised Training Plan during this Appraisal. Improvements had been made, but deficiencies still exist. Training records and OJT evaluation methods for past qualifications were difficult to audit. The Heavy Element Facility (Bldg. 251) was somewhat deficient in documenting OJT.

Hazards Control provides hazards communication training to all personnel. Health and Safety technicians are current in their retraining requirements. However, records given to the Appraisal Team indicated that radiation retraining is not current for some employees who work at the nuclear facilities.

Plant Engineering Maintenance/Operations has a good apprenticeship program, but ongoing training plan for journeymen, other than safety courses, is not established. A training management plan document did not exist but was being developed.

The NDE technician training was well developed at Bldg. 327. Deficiencies were noted in documentation of past OJT experience. New checklists had been developed to improve OJT verification.

The Security Protective Force did not have an approved training plan and training records were difficult to audit. A task analysis was in progress and efforts were underway to develop a draft training plan. The Fire Department training program was well developed and had a database containing applicable training records. Qualification requirements were well defined.

The Laser Programs had just established a Training Coordinator to assist in assessment and training activities throughout the directorate. The Laser Development Facility (LDF) at Bldg. 490 had training programs in place for the Copper Laser activities and training records were well-documented. Advanced Applications had not yet identified activities that required certification programs, although ideas were being discussed. Nova operations had established training requirements, but OJT evaluation methods were not defined.

Personnel who work with waste in the Hazardous Waste Management areas were well trained. Training records indicated that approximately 200 hours of training had been received for each of 13 employees. Training for personnel who are responsible for processing waste in the research laboratories is not as extensive. Training courses have been presented to this latter group and additional training is scheduled.

The LLNL Emergency Preparedness training was in an early stage of development. Training modules for the Crisis Management Team had been identified, but lesson plans had not been developed for initial and continuing training in accordance with good industry practice. (This is discussed further in the Emergency Preparedness Section.) Training interface with individual facilities was in need of improvement.

Human Resources coordinated training in personnel development and supervisory/management skills as requested. Personnel had been matrixed to provide expertise in training program development in such areas as the Plutonium Facility, Plant Engineering, Emergency Preparedness, and Environmental Protection. Efforts were underway to develop a LLNL Training Management Plan to provide policy and procedural guidance for performance-based training programs as specified in DOE 5480.18.

TC.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: The training organization and administration should ensure effective implementation and control of training activities.

FINDINGS:

- Training and qualification/certification requirements are not formally established for all assigned job tasks. Those requirements that do exist at Site 300 were not established on a systematic basis. At the LLNL main site, establishment of requirements on a systematic basis varied among the different organizations.

- There is neither a policy and procedures manual nor a corporate standard for training. As a result there is considerable variability in each training activity.

- Documentation of the on-the-job-training (OJT) programs is largely informal.

- Formal courses offered by the Hazards Control Department appeared adequately documented (e.g., course objectives, course outline, handouts, and visual aids). Tests were not administered for all courses.

- LLNL policy (Health and Safety Manual, 7.02) states that line management is responsible for assuring training and retraining. This is not done consistently throughout LLNL and not properly documented.

- Several organizations and facilities, such as the Security Protective Forces and Plant Engineering Maintenance and Operations, do not have an approved Training Management Plan document. The Tritium Facility issued an approved Training Plan during this Appraisal.

- The Heavy Element Facility Training Program, M-158, Rev. 1 (Section 9.0 of the Heavy Element Facility Handbook) requires a formal annual review of the training program. No such review has been documented since the May 1987 revision of the Training Program.

- Training records for the Security Protective Forces were not auditable. Individuals assumed supervisory positions before completing applicable requirements. An annual retraining program schedule had not yet been defined.

- Advanced Applications in Laser Programs had not yet determined training qualification requirements for the Metal Oxide Chemical Vapor Deposition (MOCVD), which will become a moderate hazard activity. The Nova operations group used shot checklists as operational procedures, but they had not used any type of OJT checklist as a basis for documenting trainee qualification.

- Many LLNL organizations sitewide do not take full advantage of the training record database capabilities of the Employee Development Division (EDD). EDD training resource capability is not being used consistently by all LLNL organizations.

- See Sections OP.2, OP.6, MA.1, TC.3, TC.4, TC.5, TC.8, and PT.2; and Concerns OA.1-1, SS.4-1, and QV.1-2.

CONCERN: (TC.1-1) (H2/C2) Training at LLNL is not supported by corporate policy and standards and is not formally established consistent with good practice and DOE expectations.

TC.3 NUCLEAR FACILITY OPERATIONS OTHER THAN REACTORS

PERFORMANCE OBJECTIVE: The nuclear facility operator and supervisor training and certification programs should be based on DOE 5480.5, as applicable, and should develop and improve the knowledge and skills necessary to perform assigned job functions.

FINDINGS:

- The Tritium Facility (Bldg. 331) training records audited by the Appraisal Team indicated that only three High Pressure Operators were certified. That contradicted the list of six individuals who were listed as certified as of February 23, 1990 in Appendix B attached to the Tritium Facility (Bldg. 331) Training Plan issued in March 1990.

- There are no certification policy statements for a minimum acceptable grade specified in any of the training plans for the LLNL main site nuclear facilities (Plutonium, Tritium, and Heavy Elements Facilities). The Plutonium Facility does specify an 80 percent passing criteria on individual exam cover sheets, but there is no written policy on passing criteria.

- The Heavy Element Facility (Bldg. 251) OJT for maintenance and support workers consists of orientation by the facility Health and Safety Technologist. He was on hospital leave during this Appraisal and no one in the facility could trace the documentation. Records documentation was person-dependent.

- The Heavy Element Facility (Bldg. 251) could not provide an individual's qualification documentation as an Isotope Separator Operator.

- LLNL management had not determined, during this Appraisal, how to certify the Tritium Certified Engineering Technicians. The Tritium Facility had established the safety training requirements, but the technicians were not discipline-certified by their supervision.

CONCERN: See Concern TC.1-1.

TC.4 GENERAL EMPLOYEE/PERSONNEL PROTECTION TRAINING

PERFORMANCE OBJECTIVE: General employee and personnel protection training programs should ensure that site/facility personnel, subcontractors and visitors have an understanding of their responsibilities and expected safe work practices, and have the knowledge and practical abilities necessary to effectively implement personnel protection practices associated with their work.

FINDINGS:

- o LLNL has no formal policy on how to handle employees who fail to pass safety training examinations. There is no corporate policy on standards for testing of employees.
- o LLNL has not defined or assigned an oversight role for monitoring training.
- o There is considerable variation in the degree and quality of training provided by different managers.

CONCERN: See Concern TC.1-1.

FINDINGS:

- o Training records made available to the Appraisal Team indicated that Radiation Safety Training (HS-601 and HS-660) had expired past the 2-year retraining frequency for several workers in the Nuclear Chemistry Department. Some of those employees also were not currently retrained in Health Hazards Communication (HS-405).
- o Training records maintained by the Tritium Facility (Bldg. 331) indicated that not all facility workers had maintained currency on Radiation Retraining. The Facility Manager claimed that everyone was current, but the facility records were not available to ensure that. According to the Facility Management Plan for Bldg. 331, July 1989, facility management is responsible for monitoring the status of training in facility-required safety and security courses.
- o A March 13, 1990, DOE Memorandum from Peter N. Brush (Acting Assistant Secretary, ES&H-DOE) proposes that all existing radiation and occupational workers as of December 31, 1989, are to be certified no later than December 31, 1991.

CONCERN: (TC.4-1) (H2/C2) LLNL has not maintained radiological protection retraining requirements as specified in DOE 5480.11 or in accordance with good industry practice.

TC.5 MAINTENANCE PERSONNEL

PERFORMANCE OBJECTIVE: The maintenance personnel training qualification programs should develop and improve the knowledge and skills necessary to perform assigned job functions.

FINDINGS:

- There are no requirements, standards, documentation, or formal training program for Site 300 Maintenance personnel.
- Plant Engineering Maintenance/Operations at the main site did not have an approved Training Management Plan.
- Shop supervisors determined the qualification of facility utility operators by OJT supervision. There was no documentation on how qualification was evaluated.
- Apprenticeship training in Plant Engineering was good, but training for journeymen did not have continual retraining courses scheduled other than safety-related courses.
- See Section MA.1.

CONCERN: See Concern TC.1-1.

TC.8 QUALITY CONTROL INSPECTOR AND NONDESTRUCTIVE EXAMINATION TECHNICIAN

PERFORMANCE OBJECTIVE: The quality control (QC) inspector and nondestructive examination (NDE) technician training and qualification programs should develop and improve the knowledge and skills necessary to perform assigned job functions.

FINDINGS:

- The Appraisal Team found that the QC inspector training at Site 300 was nonexistent except for that related to HE components, which was quite good.
- Records of OJT and experience for the NDE technicians did not exist at the LLNL main site Bldg. 327.
- See Concern QV.1-2.

CONCERN: See Concern TC.1-1.

TC.10 TRAINING FOR SUPERVISORS, MANAGERS AND TECHNICAL STAFF

PERFORMANCE OBJECTIVE: Training programs for supervisors, managers and the technical staff should broaden overall knowledge of processes and equipment and develop supervisory and management skills.

FINDINGS:

- The Emergency Preparedness Training Program was not fully established. Lesson plan modules for training of Crisis Management Team personnel had not been developed. Full implementation of the program was estimated at 3 years from the time of this Appraisal.
- Emergency Preparedness training had not been developed to extend to and include "self-help" facility coordinators for sitewide interaction of emergency personnel.
- Initial and continuing training schedules for retraining of Crisis Management Team personnel were not established.

CONCERN: See Concerns EP.3-1 and EP.3-2.

F. AUXILIARY SYSTEMS

This Appraisal addressed all nine Performance Objectives in the Auxiliary Systems area. Auxiliary systems at Site 300 and at the main site were evaluated primarily through physical inspections of the systems and through interviews with responsible managers, operators, and technicians. The buildings and facilities inspected at Site 300 included Bldgs. 805, 806, 826, 827, 836, 851, 871, 873, 874, 875, transformer stations, pumping stations, and hazardous waste storage areas. At the main site, Bldgs. 131, 151, 191, 231, 234, 251, 321, 331, 332, 334, 419, 492, 514, and 612 were appraised.

The principal auxiliary systems directly involved with safety at Site 300 are the fire alarm and warning systems. Since these are to be upgraded under the Secure Interactive Livermore Alarm System (SILAS) project, the only significant concern is that this project proceed quickly to completion to replace the older, increasingly obsolete systems. The emergency power generators, ventilation and exhaust systems, and waste handling facilities were the comparable auxiliary systems at the main site. These systems are either important to the safety of the process or personnel or important for the protection of the environment.

Power supplies for alarm and warning systems, including the voice communication system, were described to the Appraisal Team as having the potential to be de-energized inadvertently when specific areas at Site 300 are deactivated as various programs are completed. There is no systematic program at Site 300 that prevents de-energizing safety equipment.

As noted in the Maintenance area, the preservation of auxiliary system components is deficient. Besides general corrosion that affects the physical integrity of the water main system, the lack of preservation and lubrication of valves is an operability and reliability concern.

At the HEAF on the main site, some of the auxiliary system valves are located so high that they cannot be reached without a ladder. Also, some sections of the smoke removal system were reported as being inoperable.

Ventilation systems that have potential for unwanted release of hazardous or radioactive gases are exhausted through high-efficiency particulate air (HEPA) filters. These filters are dioctylphthalate (DOP) tested after installation before being placed in service and thereafter as required by procedures. Labels are placed on each filter depicting the date of the last test. Ventilation systems that exhaust potentially hazardous building areas or gloveboxes are provided with backup fans. Fans are powered by emergency diesel generators whenever normal electrical power is unavailable.

Emergency diesel generator systems are tested as required on a specified schedule. There are approximately 80 diesel generator systems at LLNL. Availability of the systems is ensured by periodic testing as outlined in applicable industry standards. One concern is that the tests are conducted without a checklist-type procedure which would ensure that test steps are performed in proper sequence. In addition, there is no requirement to periodically verify that the diesel fuel quality remains acceptable. Hazardous and radioactive waste generated in the experimental laboratories was found to be properly prepared for transfer to the Hazardous Waste Management facilities. Procedures and operations at the Waste Management facilities were

acceptable. Some problems are caused by delay in obtaining approval to use new facilities and temporary suspension from use of existing facilities. Personnel who work with waste in the Hazardous Waste Management areas are well-trained. A survey of training records showed that approximately 200 hours of training had been received for each of 13 employees. Training for personnel who are responsible for processing waste in the research laboratories is not as extensive. Training courses have been presented to this latter group and additional training is scheduled.

Efforts to reduce waste volume were reviewed. This is a twofold approach. First, generated waste volume undergoes size reduction; second, processes are being reviewed to determine whether modifications can be made to reduce the quantity of waste being generated. Both of the efforts have had some success. However, the program to implement the LLNL Director's Administrative Memorandum on Waste Minimization was not being aggressively implemented.

AX.1 SYSTEMS REQUIREMENTS

PERFORMANCE OBJECTIVE: Auxiliary systems shall be considered under the same functional criteria for design, engineering, operations, maintenance, and modifications as the structural, confinement, and primary process system of the facility.

FINDINGS:

- o Auxiliary systems in HEAF include a number of valves which are located so high that they cannot be operated without a ladder.
- o The smoke removal system in HEAF is not operational in two zones.
- o A number of valve and flange leaks in water or oil systems exist in HEAF and Site 300 auxiliary systems.
- o Fire alarm and warning systems at Site 300 are old, and parts are no longer made for some of their components. The replacement alarm system is not receiving priority for installation. (See Section AX.8.)

CONCERN: (AX.1-1) (H2/C2) Auxiliary systems at the explosive testing facilities are poorly designed and maintained. (See Concern MA.2-3.)

AX.3 SOLID WASTES

PERFORMANCE OBJECTIVE: Solid hazardous wastes (including radioactive wastes) should be controlled to minimize the volume generated, and handled in a manner that provides safe storage and transportation.

FINDINGS:

- o Both radioactive and clean waste generated in Bldg. 251 laboratories are disposed of as radioactive waste.
- o All waste in the radioactive material area of Bldg. 332 is assumed to be, and is handled as, radioactive waste.
- o Launderable protective clothing use is not maximized. Paper laboratory coats, rubber gloves, and plastic shoe covers are used in some buildings and then discarded as radioactive waste.
- o Kimwipes, used with alcohol to clean equipment in Bldg. 331, are disposed of as radioactive waste. Those used with acetone are disposed of as mixed waste for which there is presently no disposal process.
- o The waste minimization program was outlined by the LLNL Director in his March 8, 1989, Administrative Memo. Subsequent plans, such as the Site 300 Facility Waste Management Plan dated February 2, 1990, do not specify continuing goals for reduction of waste. The goal of a "25 percent reduction over the next 3 to 5 years" provides no incentive to continue reduction efforts once the 25 percent level is achieved.
- o Neither the LLNL Director's memo nor the Site 300 Plan emphasizes analysis to determine whether process or equipment changes can be made that would result in significant waste reductions.
- o See Concern OA.1-1.

CONCERN: (AX.3-1) (H2/C2) The Administrative Memo, "Director's Statement on Waste Minimization," issued March 8, 1989, has not been aggressively enforced.

AX.6 VITAL SUPPLY SYSTEMS

PERFORMANCE OBJECTIVE: The electric, water, and emergency power systems should reliably provide vital services as required by all facilities on the site.

FINDINGS:

- The Site 300 water system piping, valves, and pumps are not maintained and preserved (to prevent corrosion) in a manner that ensures proper operation.
- The Site 300 steam boiler in Bldg. 827 is not maintained and operated in a manner that ensures the safety of the operators, who are not formally certified for operation of the boiler.
- No long-term surveillance program is in place to ensure the proper operation and maintenance of auxiliary systems at Site 300, resulting in the deterioration of valves as well as ancillary devices such as pressure gauges and thermometers.

CONCERN: See Concerns OP.5-1, MA.2-3, and FP.7-4.

FINDINGS:

- A periodic test of the emergency diesel generators for Bldg. 251 was observed. The mechanic and electrician performing the test did not use a written procedure to verify correct test step sequence. Test data were recorded on a log sheet, but acceptance criteria are not provided on the log sheet.
- Approximately 80 emergency diesel generators are installed sitewide. These are all tested at least monthly. The diesel generator systems vary from one location to another.
- Most emergency generators, including those for Bldg. 251, are tested as prescribed by Standard ANSI/IEEE-446-1987, IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications. One system, for Bldg. 332, is tested as prescribed by applicable sections of Standard NFPA-110, Standard for Emergency and Standby Power Systems.
- Diesel fuel is not sampled to ensure that foreign matter such as water or sludge is not present in the day tank. Also tests for general degradation of the fuel are not performed. Diesel fuel is reported in Section 4.2.16 of ANSI/IEEE-446-1987 to degrade over a few months' time. A periodic test consumes only a small portion of a tank's content and the tank is then topped off.

CONCERN: (AX.6-1) (H2/C2) The availability testing of emergency generators does not verify operability of the system because there is no assurance that diesel fuel quality has not degraded, and a checklist is not completed by the test conductors as the test proceeds.

AX.8 ENGINEERED SAFETY SYSTEMS

PERFORMANCE OBJECTIVE: Engineered Safety Systems should be reliable and available to provide protection to the facility when required.

FINDINGS:

- Fire alarm and warning systems at Site 300 are very old and parts are not available for some components.
- A potential exists for inadvertently de-energizing systems important to safety, such as voice communication systems and warning signal systems, when an area of Site 300 is deactivated.

CONCERN: See Concern AX.1-1.

G. EMERGENCY PREPAREDNESS

This Appraisal addresses all seven Performance Objectives in the Emergency Preparedness category. In addition it addresses 29 CFR 1910.120 criteria for hazardous materials training and the LLNL Emergency Public Information Program requirements outlined in DOE 5500.4.

The existing LLNL Emergency Plan (EP) does not describe the emergency management team, support staff, and emergency response team duties and responsibilities in sufficient detail. The interfaces between LLNL, DOE-SAN, and DOE-HQ are not clearly defined. Organization charts do not portray the reporting chain of command for normal operations, emergency management, staff, and emergency response teams. LLNL has no matrix that reflects the relationship between the positions assigned to emergency management, support staff, and emergency response teams and their normal duty/position titles. Such a matrix would assist the Emergency Planning Training in developing an Emergency Planning Training course outline which depicts the type of training provided to members of the emergency response organization. A callout listing of all emergency response personnel, which is not referenced in the LLNL EP, is carried by the Laboratory Emergency Duty Officer (LEDO). A designated LEDO, who has been appointed by the LLNL Director and given the necessary responsibilities to perform his assigned duties, is available 24 hours a day, 7 days a week. The existing LLNL EP does not meet the criteria outlined in DOE 5500.3 and draft DOE 5500.3A. During the Appraisal Team Drill 90, emergency management team support staff and emergency response teams did perform their emergency function in a satisfactory manner to cope with the simulated event conditions.

The spectrum of emergencies likely to occur at LLNL includes major earthquakes (which, depending on circumstances, could result in a large number of casualties); fires involving hazardous and radioactive materials; civil disobedience, terrorist actions, and threats; and spills of hazardous and radioactive materials. Currently the LLNL Emergency Preparedness staff have indicated that there would be no offsite consequences from any credible release of radioactive or hazardous materials. This assumption was based on a recent LLNL Site Evaluation Program dated February 27, 1990.

Professionals in the Fire Department and Protective Services Group also provide an important component in the emergency response organization. Extensive use is made of volunteers to fill various key emergency response functions; i.e., Building Managers, members of Self-Help Building Emergency Teams, Search and Rescue, First Aid, Emergency Medical Technicians (EMTs) and other auxiliary functions. The existing LLNL emergency preparedness training program is not established as required by DOE 5500.3A.

LLNL Emergency Preparedness has developed a 2-year drill and exercise schedule that includes all aspects of credible emergencies that could affect the LLNL site. During the Appraisal Team Drill 90, the pre-drill briefing for controllers/evaluators was conducted and was very effective. The post-drill activities, including verbal and written critique and documentation, were commendable.

The LLNL Medical Treatment Facility has a well-designed decontamination and treatment center. The LLNL Fire Department demonstrated during the Appraisal Team Drill 90 an excellent method of initial response to the simulated

emergency to assume command and control required of the On-Scene Incident Commander. Due to a breakdown in communications, the Incident Commander performed his responsibilities with little or no assistance from the Emergency Operations Center (EOC).

During the Appraisal Team visit, an emergency management response drill provided the Appraisal Team with an opportunity to view the LLNL emergency response organization function under simulated drill conditions. The selected LLNL Facility was Bldg. 251, a high hazard facility. The simulated drill scenario involved a mixing operation, including a dust explosion that caused injury and contamination to the experimenter. The explosion activated an automatic sprinkler, the heat detector, and the room CAM, and contaminated the room. The CAM downstream of the high-efficiency particulate air (HEPA) filter went into an alarm condition, indicating failure of the filters that caused a release to the atmosphere outside the building. The LLNL response and activation of the LLNL emergency response organization was evaluated as appropriate for the situation.

Emergency equipment, materials, and communication systems appear to be adequate to support the requirements of LLNL during emergency response efforts. The Self-Help Emergency Lockers are stocked with first-aid supplies, flashlights, portable bullhorns, and respirators. These Self-Help kits are located at each facility and at Zone locations. Within the past few months an upgraded public address system was purchased and a test of the new system during the Appraisal Team Drill 90 was found to be acceptable. Announcements are clear and can be directed to one facility, a selected group of facilities, or sitewide. However, tests are limited due to the concern of possibly interfering with experimental or research activities. During the Appraisal Team Drill 90, late Public Address announcements were experienced.

LLNL has developed necessary Emergency Action Levels for ensuring that emergency situations are properly classified. However, recovery and termination are functions not to be addressed as emergency classifications. There was a breakdown in providing protective actions for onsite personnel during the drill via the public address system; however, it was corrected by the EOC staff. All information posted on status boards is retained by a computer operator before it is removed from the status boards.

Personnel protective requirements are contained in LLNL Health and Safety Manual, M010, January 1990, which was established using guidance in DOE 5480.1A and 5480.10, for use in emergencies for saving life or mitigation of damages to vital equipment. There are sufficient calibrated instruments for use during emergencies. As previously stated, LLNL has a complete medical decontamination facility and ambulances to transport injured personnel. Sufficient respiratory equipment, protective clothing, and material are available to support emergencies. The Self-Help Plans developed for each facility provide the necessary information to ensure a prompt evacuation of these facilities, site evacuation during emergencies, and first responder capabilities.

LLNL has developed a training program to address criteria established in 29 CFR 1910.120 for hazardous materials operation. An outside training vendor provides 24- and 40-hour training courses, as well as annual requalification training courses. This program has all the necessary documentation; i.e., training records, medical surveillances, attendance rosters, etc.

The Emergency Public Information Plan has been developed along with implementing procedures. A Letter of Agreement has been developed to use an offsite city facility as the backup news media working area. Annual briefings for local and surrounding area news media agencies are conducted on an individual basis. Within 4 to 6 months an Emergency Public Information Brochure is expected to be disseminated to offsite population.

EP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Emergency preparedness organization and administration should ensure effective planning for, and implementation and control of, site/facility emergency response.

FINDINGS:

- o Responsibilities and authority for each person in the emergency response organization are not clearly defined in the LLNL Emergency Plan (EP).
- o Technical support and maintenance personnel are not identified in the LLNL EP.
- o Twenty-four-hour operation is not addressed in the LLNL EP.

CONCERN: (EP.1-1) (H2/C1) The LLNL Emergency Plan is not in compliance with DOE 5500.3 or draft DOE 5500.3A, Chapter III, Sections 1b and c.

EP.2 EMERGENCY PLAN AND IMPLEMENTING PROCEDURES

PERFORMANCE OBJECTIVE: The emergency plan, the emergency plan implementing procedures, and their supporting documentation should provide for effective response to operational emergencies.

FINDINGS:

- The existing LLNL EP is based on site-specific safety analyses of potential abnormal conditions; however, this information is contained in another uncontrolled document.
- The LLNL EP was not coordinated with DOE-SAN, other Federal, State, and local emergency response groups.
- The detailed actions required to carry out the emergency plan are not specified in the implementing procedures. Procedures are not consistent with, and not cross-referenced with, the EP and other documents.
- Description of emergency response facilities, installed equipment capabilities, and communications systems is not included in the EP.
- An emergency planning matrix to show the relationship between all emergency response titles and normal duty positions has not been developed and included in the LLNL EP.
- See Concern OA.5-3.

CONCERN: (EP.2-1) (H2/C1) The LLNL Emergency Plan is not in accordance with DOE 5500.3 or draft DOE 5500.3A, Chapter III, Planning and Preparedness (i.e., Hazards Identification, Updating Hazards, Analysis Requirements, Accident or Event Characteristics).

FINDINGS:

- Existing controlled Emergency Plan Implementing Procedures (EPIPs) do not have revision numbers, date of issuance, or approval signatures.
- The majority of the EPIPs do not contain any written responsibilities, precautionary or limitation statements; mostly they consist of checklists.
- EPIPs do not provide detailed information and specific written instructions and actions necessary to implement the LLNL EP.

CONCERN: (EP.2-2) (H2/C1) LLNL Emergency Plan Implementing Procedures are not in accordance with the requirements of DOE 5500.3 or draft DOE 5500.3A which address the facility emergency operations.

EP.3 EMERGENCY RESPONSE TRAINING

PERFORMANCE OBJECTIVE: Emergency response training should develop and maintain the knowledge and skills for emergency personnel to respond to and control an emergency effectively.

FINDINGS:
- o Facility Managers and the Facility Technical Coordinator have not received any formal, documented training in emergency response functions.
- o See Section TC.10.

CONCERN: (EP.3-1) (H2/C1) Emergency Response Training Programs have not been developed for all LLNL Facility Managers and Technical Coordinators and do not ensure adequate documentation of the program in accordance with DOE 5500.3 or draft DOE 5500.3A, Chapter III., Section 1.

FINDINGS:
- o The existing LLNL Emergency Response Training program is not formalized; it does not include lesson plans, training matrix, job task analyses for each member of the Emergency Management Team, required documentation and retention of records, and written examination with passing grade.
- o See Section TC.10.

CONCERN: (EP.3-2) (H2/C1) LLNL Emergency Response Training is not in compliance with DOE 5500.3, draft DOE 5500.3A, and the DOE Training Accreditation Program (TAP).

FINDING:
- o The annual requirements for providing public information briefings to the local news media, television, and radio stations have been accomplished, but there is no documentation available to record these briefings.

CONCERN: (EP.3-3) (H2/C1) The Emergency Public Information Program is not in accordance with DOE 5500.3 or draft DOE 5500.3A, Chapter III., Public Information, in that timely release of public information was not made to simulated offsite agencies.

EP.4 EMERGENCY PREPAREDNESS DRILLS AND EXERCISES

PERFORMANCE OBJECTIVE: Emergency preparedness programs should include provisions for simulated emergency drills and exercises to develop and maintain the knowledge and skills for emergency personnel to respond to and control an emergency effectively.

FINDINGS:

- Drill participants do not use the phrase "THIS IS A DRILL OR EXERCISE" during all conversations on telephones, radio, nor end all conversations including all Fax messages with these terms.

- Required facility-generated local drills are not documented; i.e., attendance records, scenarios, and other supporting documents are not provided as informational material to the Manager, EP Training.

CONCERN: (EP.4-1) (H2/C1) The LLNL Emergency Preparedness drill and exercise program does not comply with requirements of DOE 5500.3, that all facility drills are not documented.

EP.5 EMERGENCY FACILITIES, EQUIPMENT, AND RESOURCES

PERFORMANCE OBJECTIVE: Emergency facilities, equipment, and resources should adequately support site/facility emergency operations.

FINDINGS:

- o LLNL has recently upgraded the public address (PA) system which was demonstrated twice during the Appraisal Team Drill 90. However, PA system tests were not routinely conducted due to possible interference with research programs. This PA system has the capability to make announcements sitewide or to selected individual buildings.

- o "As-built" drawings of facilities are not available in the EOC. There are numerous blueprints but no microfiche prints. See Concerns TS.3-2 and OA.7-2.

CONCERN: (EP.5-1) (H2/C2) The equipment, materials, resources, and documentation requirements of draft DOE 5500.3A are not used to ensure that all required items are available for emergencies in the LLNL Emergency Operations Center.

EP.6 EMERGENCY ASSESSMENT AND NOTIFICATION

PERFORMANCE OBJECTIVE: Emergency assessment and notification procedures should enable the emergency response organization to correctly classify emergencies, assess the consequences, notify emergency response personnel, and recommend appropriate actions.

FINDINGS:

- Emergency Classifications used at LLNL consist of "Unusual Event" through "General Emergency"; however, LLNL has added "Recovery" and "Termination," which are not considered event classifications; both are phases of our post-emergency operations.

- An initial coordination meeting held on February 22, 1990, with the State and local agencies to begin to develop offsite relationship with offsite emergency management. LLNL Emergency Action Levels (EALs) have not been reviewed or approved by the State or local agencies.

- The LLNL EP does not address the 15-minute notification requirement for offsite agencies.

CONCERN: (EP.6-1) (H2/C1) LLNL does not have the necessary coordination meetings by the State and local emergency management agencies to obtain approval of the LLNL Emergency Plan, Emergency Action Levels and Emergency Classification Systems, as required in DOE 5500.3.

EP.7 PERSONNEL PROTECTION

PERFORMANCE OBJECTIVE: Personnel protection procedures should control and minimize personnel exposure to any hazardous materials during abnormalities, ensure that exposures are accurately determined and recorded, and ensure proper medical support.

FINDINGS:

- o A detailed listing of hazards for LLNL has not been developed and entered into the LLNL EP including events specified in draft DOE 5500.3A for Sabotage Assessments, Pre-Fire Plan, Chemical; including amounts and storage locations; and listing of hazards contained in environmental reports.

- o Accidents analyzed in the SAR are not included in the LLNL EP. In addition, the hazards caused by more severe initiating conditions are not analyzed per DOE 5632.1A.

- o Protective action guidance is limited as addressed in the LLNL EP.

- o See Concerns IH.3-1, OA.7-1, TS.2-2, and TS.2-3.

CONCERN: (EP.7-1) (H2/C2) The LLNL Emergency Plan does not meet the requirements of draft DOE 5500.3A, Chapter II, Hazards Assessment, in providing a detailed listing of hazards and accidents analyzed in the Safety Analysis Report.

H. TECHNICAL SUPPORT

Five of the eight Performance Objectives were addressed in the Technical Support area. Reactor Engineering was not applicable to LLNL; Criticality Safety and Packaging and Transportation of Hazardous Materials were appraised as separate areas by other Appraisal Team members. The scope of this Appraisal included visits to major LLNL facilities at both Site 300 and the main site, interviews with management and staffs of technical support organizations, and reviews of manuals, procedures, Safety Analysis Reports (SARs), and record files. Program facilities visited were Bldgs. 191, 251, 321, 331, 332, 513/514, 801, 817, 827, 834, and 851. Support organizations interviewed were the Hazards Control Department, the Environmental Protection Department, the Engineering Directorate, and Plant Engineering.

Technical support for LLNL programs is provided by elements of the Hazards Control Department, the Environmental Protection Department, Program Divisions, the Engineering Directorate, and Plant Engineering. This support is primarily provided through a matrix system, which assigns responsibility for individual facilities or groups of facilities to subcomponents of the support organizations. This system enhances the support staff's familiarity with the facilities and programs, but also leads to a diversity of approaches and quality.

Overall, the technical support functions were judged to contribute effectively to the LLNL programs and facilities. There were, however, seven concerns identified during the Appraisal of Technical Support. These concerns were related to SARs, Operational Safety Requirements (OSRs), procedure reviews, Operational Readiness Reviews (ORRs), "as-built" drawings, and exhaust system monitoring.

Technical support organizations are staffed with well-qualified personnel: supervisors, engineers, scientists, technicians, and craft staff. Duties, responsibilities, and qualification requirements are defined in job postings and in annual appraisal documents for each individual. Some organizations, such as Plant Engineering, have published manuals defining duties, responsibilities, and authorities of all organizational components. Overall, the technical support staffs were found to have sufficient definition and understanding of their roles to provide effective support.

Four concerns were identified in the Procedures and Documents area. Most of the facilities do not have approved, in-place SARs or OSRs as required by DOE Orders and DOE SAN Management Directives. Most of the SARs that are in place are several years old and do not meet current standards for content and format. Efforts to provide up-to-date SARs for Bldgs. 331 and 332, prompted by recommendations from earlier TSAs, are in progress and targeted for completion this year. The few OSRs that have been written are also deficient in content and format. Facility Operating Procedures and Operational Safety Procedures, which currently provide the procedural safety envelope, are generally effective but have some deficiencies. Procedures for technical support activities (e.g., design procedures, analytical procedures, and surveillance/testing procedures) vary in quality and detail from one

organization to another. However, the support activities overall are performed effectively.

Facility modifications are designed and implemented by qualified technical staff. Formal review processes, which involve review of designs by the appropriate program, Hazards Control, Maintenance, Security, and other interfacing organizations, are in place and are used. The engineering organizations are cognizant of, and use, relevant codes, standards, and regulations, including those mandated by DOE 5480.4 and DOE 6430.1A. Two concerns were identified in this area: lack of definitive guidance for ORRs, and deficiencies in "as-built" drawings.

Equipment performance testing and monitoring are conducted in accordance with prescribed schedules. The use and quality of written procedures for this activity varies from organization to organization. Equipment performance data are compiled and stored in computer databases. Trending and analysis of the data are not done on a formal basis, except for a few special areas (e.g., vibration monitoring and performance of high-speed cameras).

Site management has made reasonable efforts to minimize quantities of radioactive and hazardous materials released to the environment. Contaminated and suspect liquid wastes are collected in holding tanks, sampled, and analyzed prior to release. Exhaust air and gas streams are filtered, scrubbed, etc., as appropriate. Construction of onsite sewer diversion capability, as recommended by an earlier TSA, is in progress. Systems for monitoring and sampling effluent streams are not capable of quantifying all hazardous material releases and their sources. Programs to identify and meet anticipated needs for additional monitoring have been initiated.

TS.2 PROCEDURES AND DOCUMENTS

PERFORMANCE OBJECTIVE: Technical support procedures and documents should provide appropriate direction, allow for adequate record generation and maintenance for important activities, and should be properly and effectively used to support safe operation of all facilities on the site.

FINDINGS:

- o Use of procedures for performing technical support services such as engineering design, sample analysis, etc., is variable across LLNL. Plant Engineering and the Mechanical Engineering Department of the Engineering Directorate have rather well-developed procedures, but there is no LLNL system requiring development and use of procedures.

- o Safety Procedures are circulated to a series of reviewers comprising facility management, program management, health and safety disciplines in the Hazards Control Department, the Safety Team Leader, and any others as specified by anyone who reviews the procedure. In the review process, a copy of the circulating draft or revised procedure is marked up by sequential reviewers, who also sign off their review on a signature sheet. The procedure is then modified by its author based on this input and the final draft is recirculated to facility, program, and Hazards Control Department representatives for signature approval. Its use is finally approved by signature of the appropriate manager. At Site 300 this is the Resident Manager. At the main site the approval level depends upon the safety issues, as specified in the LLNL Health and Safety Manual.

- o The records for auditability of all persons who have reviewed procedures is inconsistent. At the time of procedure issue or reissue, the marked-up draft copy is disposed of. In the past, individual signature sheets have also been disposed of; thus the only source of the review's auditability is lost.

- o Observations of available signature sheets and of procedure signatures indicate that Operational Safety Procedures (OSPs) or Facility Safety Procedures (FSPs) do not receive an independent technical peer review at the facility or program level prior to review by Hazards Control, other support organizations, and management.

- o The technical organizations which design facility systems do not routinely review operating and maintenance procedures for the equipment.

- o See Sections PT.1 and CS.3.

CONCERN: (TS.2-1) (H2/C2) The review system for LLNL safety procedures does not ensure auditability of reviews or performance of independent technical peer reviews within the originating organization.

FINDINGS:

- o A proposed hazard classification listing of LLNL facilities was submitted to DOE SAN in July 1989. Discussions with Hazards Control Department staff indicated that this listing was not

based upon a systematic technical analysis of facility hazards, but largely upon a qualitative examination.

- o Responsibility for safety documents lies with the line program organizations. There is no function at LLNL that tracks status and needs on a sitewide basis. The Safety Analysis function within Hazards Control has been reduced to one of maintaining the LLNL Safety Analysis Guide and providing guidance to the programs when requested.

- o There has been no systematic determination of the adequacy of safety documentation for most ongoing LLNL operations, as required by DOE 5481.1B, Chapter I, Part 4. Needs for SAR upgrading have been identified primarily through DOE appraisals or impending changes to facility configuration and/or operations.

- o See Sections TS.4, EP.7, and FP.3, and Concern OA.7-1.

CONCERN: (TS.2-2) (H2/C1) LLNL has not made a determination whether existing safety analysis documentation adequately identifies the risks associated with all of its operating facilities that can be reasonably expected to have potential for major onsite or offsite impacts to people or the environment, as required by DOE 5481.1B, Chapter II, Section 4.

FINDINGS:

- o Many of the LLNL facilities that would require approved SARs or Safety Analysis Documents (SADs) under SAN MD 5481.1A guidance do not have such documents in place. Such documents were never written for some facilities. For other facilities, including Bldg. 331 (Tritium Facility) and Bldg. 332 (Plutonium Facility), SARs were written but did not receive formal DOE SAN concurrence, and are still considered drafts.

- o TSAs of Bldgs. 332 and 331, in 1986 and 1987, respectively, identified SAR deficiencies. Actions to provide up-to-date SARs which meet current standards are in progress, with completion targeted for 1990. At the time of the facility TSAs, completion was expected in 1987 and 1988.

- o The SARs and SADs which do exist date back as far as the 1970s, and do not conform to current format and content guidance provided in DOE 5480.5, Section 8.a, and SAN MD 5481.1A.

- o DOE SAN's current position is that it approves Operational Safety Requirements (OSRs) and authorizes facility construction and operation based upon safety analyses, but does not formally approve SARs and SADs.

- o Existing SARs for Bldgs. 251, 520, 804, 850, and 851, and SADs for Bldgs. 151 and 419 and the 514/612/614 complex, do not have a true accident (e.g., off-normal event) analysis, any facility Operational Safety Requirements (OSRs), recognition of any limiting conditions for operations (LCOs), nor designations of equipment important to safety. A number of the "analyses" in these documents consisted largely of unsupported assertions.

- See Concern OA.7-1 and Sections EP.7 and TS.4.

CONCERN: (TS.2-3) (H2/C1) Not all LLNL facilities that require Safety Analysis Reports have them in place, and existing Safety Analysis Reports and Safety Analysis Documents do not adequately define Operational Safety Requirements, designate equipment important to safety, or reflect complete safety analyses as required by DOE 5480.5, DOE 5481.1B, and LLNL Safety Analysis Report guidance.

FINDINGS:

- With few exceptions the LLNL facilities do not have OSRs, as required by DOE 5480.5 for nuclear facilities and recommended for all high, moderate, and low hazard facilities in the guidance of SAN MD 5481.1A.

- SARs for HEAF (Bldg. 191) and Hardened Engineering Test Building (HETB) (Bldg. 334) do contain OSRs. However, these exhibit several deficiencies:

  - Neither set of OSRs is in complete conformance with the content and format recommended in the LLNL Safety Analysis Guide (SAG), SAN MD 5481.1A, or the appropriate NRC Regulatory Guides (3.26 and 3.39). It was noted that the SAG and DOE-SAN guidance is not entirely consistent with the two NRC Regulatory Guides.

  - The OSRs do not contain bases that clearly identify the safety implications of exceeding limits or controls, nor do safety analyses elsewhere in the SARs make an adequate case for the OSRs.

  - The OSRs do not present the recovery methods associated with their violation. The HETB OSRs do not contain Surveillance Requirements.

  - The HETB OSRs, in general, do not contain numerical limits; for example, no alarm levels are specified for the oxygen monitors.

- The HETB OSRs and Facility Safety Procedures (FSPs), e.g., Bldg. 331, do not clearly distinguish between requirements and descriptive material. The style is largely narrative, with a mix of "shalls," "shoulds," "wills," "ares," etc., and there is no clear definition of which items are mandatory.

- See Sections OA.5 and FR.3, and Concerns OA.7-1, FR.3-1, and OP.1-2.

CONCERN: (TS.2-4) (H2/C1) Not all LLNL facilities have Operational Safety Requirements (OSRs) in compliance with DOE 5480.5 requirements and SAN MD 5481.1A guidance. Those OSRs that do exist are deficient in content and format.

TS.3 FACILITY MODIFICATIONS

PERFORMANCE OBJECTIVE: Technical support services required by each facility on the site to execute modifications should be carried out in accordance with sound engineering principles that should assure proper design review, control, implementation, and documentation in a timely manner.

FINDINGS:

- The LLNL Health and Safety Manual, in Part 2.09, identifies an Operational Readiness Review (ORR) as a particularly critical safety evaluation to be performed before a work activity is to start. This brings the DOE 5480.5 and SAN MD 5480.5 ORR requirements into the LLNL system.

- For guidance on the ORR process the Health and Safety Manual merely says to "Contact your Safety Team Leader for specific guidance." There are six main site Safety Team Leaders, each responsible for a set of facilities. There is no definitive written guidance to direct the Safety Team Leaders and provide consistency in ORR approaches and quality across LLNL.

- The Engineering Directorate staff stated that the ORR planning process currently is an iterative process between LLNL and DOE SAN.

CONCERN: (TS.3-1) (H2/C2) There is no definitive guidance within LLNL to ensure consistency of approach and quality for Operational Readiness Reviews.

FINDINGS:

- Not all copies of drawings maintained in facility files reflect "as-built" status. In fact, not all facility drawings in the Plant Engineering master files reflect "as built" status as required by the Plant Engineering Policy and Operations Manual.

- The Site 300 Plant Engineering Group has facility drawings on site, but the staff does not know if the sets are complete or accurate. Existing drawings are reportedly checked against actual configurations before scheduling related work or improvements.

- The incomplete status of "as-built" drawings was the subject of a recommendation in the 1986 Tritium Facility TSA. Discussions with the Tritium Facility Manager disclosed that the focus for upgrading "as-built" drawing status was on systems important to safety. The upgraded drawings were available for DOE SAN review by the end of February 1990. There are no plans to create "as-built" drawings for other systems at that facility.

- Plant Engineering staff stated that "as-builts" for jobs performed by outside contractors are generally in good shape, as furnishing "as-builts" is required for contract closeout and payment. However, for in-house jobs there frequently are problems stemming from lack of funds for "as-built" work when

construction has been completed. Plant Engineering has issued an "As-Built" Drawing Documentation Procedure, dated March 1990, addressing this problem.

- o Documentation of approvals (initials and dates) on facility drawings, as required by the drafting manual, is inconsistent. The same was noted on electronic schematics in Bldgs. 801 and 827, particularly for more recent drawings. Tower drawings for Job No. 8816, File No. 3308801, in the Plant Engineering Files, had been signed by a Registered Professional Engineer. The engineer had included his registration number, but had not stamped the drawings as required by LLNL for contractor-provided drawings. The LLNL approver had not reinitialed or redated the drawings following the last revision.

- o See Section EP.5.

CONCERN: (TS.3-2) (H2/C2) Facility and schematic drawings do not completely conform to the requirements of the LLNL Plant Engineering Policy and Operations Manual in regard to approvals and showing of correct "as-built" status. (See Concern OA.7-2.)

TS.4 EQUIPMENT PERFORMANCE TESTING AND MONITORING

PERFORMANCE OBJECTIVE: Effective equipment performance testing and monitoring should be performed by technical support groups to ensure that equipment and system performance is within established safety parameters and limits.

FINDINGS:

- o Performance testing and monitoring of support equipment are included in the maintenance and operating procedures. However, a formal equipment performance trending and analysis program is not in place for the electronics and mechanical equipment supporting the research equipment. Trending is done on an informal basis to check for problems in multi-group equipment.

- o Maintenance and Operations Department staff compile performance and testing information in a computerized database. There is no formal process for analyzing the data; however, they are printed out and reviewed. This also was the practice for other organizations with which the analysis process was discussed.

- o At this time, a process does not exist to examine and identify monitoring systems important to safety; thus no special monitoring, trending, or maintenance requirements have been imposed on them. However, the Maintenance and Operations Department is developing a program to identify a core group of critical systems and provide special knowledge of these systems. A document defining this program has been issued; implementation of the program, beginning with Bldg. 332, is expected to start by April 1990.

CONCERN: See Concerns TS.2-2, TS.2-3, QV.1-1, MA.7-1, FP.7-2, and OA.5-5.

TS.5 ENVIRONMENTAL IMPACT

PERFORMANCE OBJECTIVE: The impact on the environs from the operation of each facility on the site should be minimized.

FINDINGS:

- Liquid wastes that may contain radioactive and/or toxic materials are collected in holding tanks, sampled, and analyzed prior to release to the LLNL sanitary sewer system. The sewer stream is monitored, with alarm capability, prior to leaving the site and entering the Livermore City system. Diversion capability, recommended in the Plutonium Facility TSA in 1986, is being added in a project currently under construction and scheduled for completion in FY 90.

- Plans have been developed to increase the number of onsite sewer system sampling stations from five to nine, and to provide all nine stations with monitoring and alarm capability as well as sampling capability. The current schedule is for installation of the stations in FY 91 and addition of the monitoring capability in FY 92.

- Exhaust air streams that might contain radioactive materials are monitored and sampled. However, this is not done for all exhausts that might contain hazardous materials:

  - Exhausts from beryllium handling operations in Bldg. 331 and the C Wing of Bldg. 321, and

  - Exhausts from two enclosures in Bldg. 513 in which mixed wastes are processed.

  These specific exhausts are high-efficiency particulate air (HEPA) filtered, indicating some potential for generation of airborne toxic particles.

- There have been no systematic documented evaluations to support the lack of capability to monitor or sample for hazardous wastes in the exhaust streams.

- A proposal has been prepared, by the LLNL Environmental Monitoring Group, to evaluate the need for additional exhaust monitoring and sampling capability, and make any improvements indicated by this evaluation. This proposal has been submitted to DOE for funding in and beyond FY 91. Although the current site perimeter monitoring is believed to meet the Bay Area Quality Management District requirements for LLNL, more stringent monitoring requirements are anticipated for the future.

CONCERN: (TS.5-1) (H2/C2) Ventilation exhaust streams which might contain hazardous materials are not all monitored or sampled to quantify releases, and the lack of monitoring/sampling has not been justified by documented analyses.

I. PACKAGING AND TRANSPORTATION

All 10 Performance Objectives were used to appraise the Packaging and Transportation area. The program for packaging and transportation of hazardous materials at LLNL was evaluated based on a review of pertinent LLNL policy documents and manuals, Operational Safety Procedures (OSPs), Facility Safety Procedures (FSPs), Safe Operating Procedure (SOPs), and two audit reports. Interviews were conducted of staff and management personnel in Materials Management Division (MMD), Materials Distribution Division (MDD), Hazardous Waste Management Division (HWMD), and LLNL Safety Teams 3, 4, and 5 (including Site 300 representatives) to identify and validate findings. Packaging, in-transit storage, and onsite transportation operations were observed at both the main site and Site 300.

The packaging and transportation program benefits greatly from the high degree of staff expertise and conscientiousness in the three transport organizations involved. The accident record has been good.

This good past performance has been achieved in spite of the present management systems, rather than because of them, since those systems have resulted in numerous violations of Department of Transportation (DOT) regulations and DOE directives.

There is no cohesive, coordinated, consistent program at LLNL for packaging and transportation of hazardous materials. There is no focal point--no single office, no committee--for transportation matters.

There appears to be a complacent attitude of "assumption of compliance" toward transportation safety sitewide, except within MMD. In general, the belief seems to be that the lack of serious violations means an effective safety system exists.

There is little evidence that LLNL top management considers safety in the packaging and transportation of hazardous materials to be an important consideration. Management safety policies in packaging and transportation are sparse, nonspecific, and conflicting. Procedures are often missing or incomplete, insufficiently reviewed, and in conflict with one another. Responsibilities are clearly assigned, although sometimes conflicting.

The LLNL Safety Teams, which are relied on to provide guidance, assistance, and overview in packaging and transportation, have no transportation expertise and are not trained in that area. Staff turnover is high in both the Safety Teams and HWMD, limiting their ability to ensure safety compliance.

Except for the LLNL Safety Teams, the training program in packaging and transportation is extensive and effective, even though the program requirements are not well documented in procedures. There is no program for incorporating "lessons learned" from other DOE operations and industry.

The LLNL Quality Assurance (QA) program for packaging and transportation is deficient. Plans are incomplete, inconsistent, or missing. Sitewide QA directives are out-of-date and vague. Although there have been two recent audits (MMD and HWMD), there is no effective independent audit system. Many of the audit findings are still unresolved.
For over 5 years, the DOE has urged LLNL to establish a sitewide safety

checklist system. Except for MMD, checklists are rarely used in packaging and transportation operations. Many of the regulatory violations observed during the appraisal could have been avoided if this simple feature had been implemented.

Safety standards and procedures are developed, carried out, and verified by the same people. This conflict of interest precludes an objective overview and analysis of the operations to detect impending safety program failures and violations. Numerous examples of this breakdown were found. Many of the people interviewed thought that regulatory standards themselves constitute procedures, rather than procedures being a way to meet the standards.

There is no efficient and effective mechanism at LLNL to detect and correct transportation safety system problems before they occur. There was ample evidence of mismarked drums of waste, mislabeled gas cylinders, unplacarded vehicles, inappropriate means of carriage, and incorrect paperwork. The system for handling, identifying, and transporting hazardous materials is a Category II concern (Concern PT.6-1).

The major causal factors of the present deficiencies in the transportation program appear to fall into five general categories. It should be noted that the numerous deficiencies found were not the result of an extensive or complete sample, but are interpreted to be representative of the predominant situation:

- Ineffective independent oversight of packaging and transportation.
- Absent or ineffective checks and balances to assure that the procedures have been followed.
- Absence of a central coordinating group for all packaging and transportation activities.
- Inconsistency between the three primary transportation organizations.
- Assignments by management of responsibilities and duties that inherently constitute conflict of interest.

The LLNL Quality Assurance Manual (QAM), M-078, asserts that safety relies more on good leadership than on written procedures. The Appraisal Team found that philosophy to be prevalent in the operations, and also found those operations to be in violation of DOE directives and the Federal regulations. When applied to the overall transportation safety program, such a philosophy is counterproductive and out of place in a modern safety culture.

PT.1 ADMINISTRATION AND ORGANIZATION

PERFORMANCE OBJECTIVE: Management should develop and implement a system of policies and directives that will provide for effective implementation of Department of Energy (DOE) Orders, particularly DOE 5480.3, Federal and State regulations, and good industrial practices in operations involving packaging and transportation of hazardous materials.

FINDINGS:

- There is no evidence of a documented or demonstrated recognition by LLNL top management of the need for a comprehensive and consistent Packaging and Transportation (PT) safety policy or program. For example, the subject of PT safety was not mentioned in the inbriefing for LLNL Tiger Team. (See Concern OA.4-1.)

- There are three separate PT functions: (1) Materials Management Division (MMD) for "controlled" hazardous materials, (2) Hazardous Waste Management Division (HWMD) for hazardous wastes, and (3) Materials Distribution Division (MDD) for all other hazardous materials. All three operate independently, resulting in a fragmented sitewide program.

- There is no central PT coordinating group, contrary to LLNL's Hazardous Materials Control Policy (HMCP). In fact, the PT program is not coordinated. The LLNL Quality Assurance Manual (QAM), (M-078, Suppl. 1, pages 5, 11, 12), implies that MDD is the coordination point for PT. The MDD draft QAM (M-078-93) makes the same implication, but in practice MDD does not perform this role. LLNL Health and Safety Manual (HSM), Sections 8.09 and 33.41, implies that MMD, rather than MDD, might have some of these same coordinating functions. (See Section PT.9.)

- There is no provision for ensuring uniformity in PT operations at LLNL, contrary to LLNL's HMCP. In fact, the three activities do not operate uniformly. They only occasionally communicate with each other on PT operations, and then usually in reaction to some problem.

- There is no documented overall PT safety program at LLNL for either onsite or offsite operations. (See Sections PT.8 and PT.9.) LLNL sitewide PT policy statements are vague and do not provide specific guidance.

- There is no sitewide transportation committee to review and coordinate the various interrelated facility PT activities. (See Concern FR.1-1.)

- Procedures and standards for providing safety in hazardous materials packaging and transportation, both on and off the site, are incomplete, inconsistent, conflicting, and too general to be of practical operating use.

- Section 8 of the HSM does not specifically cover HWMD operations, and covers MMD and MDD only generally. Procedures for offsite shipment of hazardous material cover only fragmented

portions of the total operation. Sections 8, 24, 29, 33, and 35 of the HSM make some mention of PT, but there is no in-depth coverage.

- o LLNL departmental and divisional policies, procedures, and operating instructions for PT safety are lacking in detail and are inadequate to meet the requirements of DOE 5480.3, Sections 9. and 10.

- o Responsibilities are assigned in the various PT documents, but there are overlaps, inconsistencies, and conflicts between MMD, HWMD, and MDD. For example: pages 11-12 of QAM (M-078, Suppl. 1) state that MDD releases all commercial shipments, but HWMD also does it in practice, and is authorized to do so in their own documents. The Supply and Distribution Department Procedure 420-5 defines hazardous materials differently than the HSM Section 8. There is also a mismatch in responsibilities and procedures between Procedure 420-5 and the MMD Manual, Vol. VI. (See Concerns OA.1-1, OA.1-2, and OA.1-3.)

- o The MMD Material Accountability Manual states that the Site 300 MMD representative has no authority or responsibilities for PT, but in practice that person has many responsibilities and exercises significant authority in PT.

- o There was little evidence that LLNL Safety Teams 3 and 4 can or do carry out the PT-related duties assigned to them in HSM Section 8.09; LLNL Safety Team 5 is somewhat more involved in PT. (See Section FR.2.)

- o Safety review of PT aspects of procedures, QA plans, and other such documents is insufficient.

- o Observations of available signature sheets indicate that the requirements for PT safety review and sign-offs on QAPs and operating procedures are inconsistent. There is no stated requirement for Safety Team sign-off on such documents. Site 300 Procedure 108, regarding operation of vehicles carrying explosives, was not signed off by MDD or MMD.

- o There is no program for cross-review (technical peer review) by MMD, HWMD, and MDD of each other's PT procedures and QA documents, with resultant nonuniformity of procedures. The Hazards Control Department (HCD) and its Safety Teams are only sporadically involved in review of MMD, HWMD, and MDD written procedures and QA documents covering PT. Safety reviewers are assigned on an ad hoc and inconsistent basis.

- o LLNL Safety Teams 3 and 4 are too short-handed to meet their responsibilities for safety verification. Staff turnover is high.

- Staff turnover in HWMD is a continuing problem. HWMD staffing is insufficient to perform all PT operations with a high degree of assurance of regulatory compliance. There are 9 unfilled technician positions (out of a total of 23 such positions) in HWMD, which makes it difficult to provide sufficient attention to detail. (See Section PT.6.)

- See Concerns OA.1-6, TS.2-1, PT.6-1, and MA.1-3.

CONCERN: (PT.1-1) (H1/C1) The hazardous materials transportation program is fragmented, uncoordinated, inconsistent, ineffective, and not in compliance with DOE Orders.

PT.2 TRAINING

PERFORMANCE OBJECTIVE: Personnel should be trained, qualified, and certified in handling hazardous materials as required by DOE 5480.3 and 49 CFR Parts 173 and 390-397.

FINDINGS:

- The documented training requirements for PT personnel do not reflect the significant depth and frequency of the training actually performed. Written procedures are nearly silent on training requirements for hazardous materials packagers and drivers.

- There is no sitewide formal program for incorporating "lessons learned" into the PT activities. It was observed that there is no DOE-wide information system for "lessons learned" on PT.

- HCD is assigned the responsibility for providing and coordinating safety training, but most PT training is arranged for directly by the three PT organizations. There is no sitewide PT training plan.

- Training for LLNL Safety Teams 3, 4, and 5 is inadequate to allow them to provide safety advice, assistance, or overview in packaging and transportation safety required of them in the LLNL procedures. Those teams have the responsibility for providing PT services to MMD, HWMC, and MDD but have no team members trained or experienced in hazardous materials packaging and transportation.

CONCERN: See Concerns TC.1-1, PT.6-1, and OP.6-1.

PT.3 QUALITY ASSURANCE

PERFORMANCE OBJECTIVE: A system of checks and balances should exist that ensures that the quality assurance (QA) requirements of the applicable DOE Orders and ANSI NQA-1-1986 are met.

FINDINGS:

- The LLNL QAM (M-078, Suppl. 1) for packaging and transportation is vague, does not provide specific guidance, and is out-of-date (September 1985). The QAM does not contain the essential QA program elements required by DOE 5480.3, DOE 5480.5, or DOE 5700.6B.
- The individual QAPs for the three LLNL PT organizations are general and inconsistent. The MDD QAP is still in draft after over 5 years in preparation. There is no program for cross-review (technical peer review) of each other's QAPs.
- There is no PT QAM specific to Site 300. The draft MDD QAP does not cover Site 300. Coverage of Site 300 in the MMD QAP is minimal.

CONCERN: See Concern QV.1-1.

FINDINGS:

- HSM Sections 8.09 and 33.41 assigns responsibility for "controlled" (including radioactive) materials to MMD to: (1) provide guidance and interpretations of regulations, (2) develop procedures to ensure compliance, (3) follow the procedures (do the packaging and transportation), (4) determine the adequacy of the procedures, and (5) verify compliance (overview their own work). This is a conflict of interest within MMD in that it does not provide for either independent oversight of PT compliance or an independent safety organization review of PT safety standards.
- The LLNL Safety Teams have much the same responsibilities as MMD. The HCD cannot provide independent oversight of the PT safety operation in which they have been involved.
- The inherent conflict of interest in the PT safety functions precludes checks and balances between the three basic elements of safety: setting standards, operational compliance, and compliance verification. The conflict of interest does not allow an objective implementation of the PT safety program.

CONCERN: See Concerns FR.1-1, QV.1-1, and OA.2-1.

FINDINGS:

- The audit and appraisal program for PT does not meet the requirements of DOE 5480.3 and DOE 5700.6B.
- There is no routine QA program for overview of the various PT functions. Audits by an independent group are infrequent and irregular, contrary to the DOE requirements. They are not sufficient to document deficiencies in the PT QA program. There

was also no independent overview of the LLNL Safety Teams with respect to their PT functions.

- o The annual PT program appraisals prescribed in the QAM, (M-078), page 2, are not done. The audits required by Supplement 1, page 14, on a 1- to 3-year cycle, have not been routinely done throughout LLNL. Independent audits were recently completed for HWMD and MMD, but an audit of MDD has not yet been done.

- o The LLNL QA audit program has no member expert in, or even reasonably knowledgeable in, PT of hazardous materials. Knowledgeable experts outside of the QA office can be used if they have received QA training and a certified lead auditor is used.

- o The QA staff lacks sufficient expertise to recognize the need for including transportation safety items in precontract award inspections and in routine onsite and offsite shipping and transportation activities.

- o See Concerns FR.4-2, QV.1-1, and OA.5-4.

CONCERN: (PT.3-1) (H2/C1) The audit and appraisal program is insufficient in both frequency and depth to ensure that the quality assurance (QA) requirements of DOE 5480.3 and DOE 5700.6B are met.

FINDINGS:

- o Except for MMD, there are no provisions at LLNL for the use of checklists of other documentation to guide the conduct of a PT activity and to measure how it was performed.

- o Checklists are seldom used and do not exist for some critical PT activities in HWMD and MDD. They are not referred to in the procedures. There is no system to ensure that checklists are periodically reviewed or updated.

CONCERN: See Concerns OP.3-3, MA.1-3, PT.6-1, and QV.1-2.

FINDINGS:

- o There is no effective formal documented program for corrective action and for following up on findings of PT appraisals/audits, as required by LLNL QAM (M-078, page 4), and DOE 5480.3 and DOE 5700.6B. Several problems identified in previous appraisal reports (e.g., container procurement verification, quality assurance, onsite and offsite transportation safety manuals, documented training program, checklists) are still unresolved. Response has not been timely and positive. Audit findings are not reviewed by LLNL management to ensure timely closure.

- o See Concerns FR.6-1, PT.4-1, and OA.5-1.

CONCERN: (PT.3-2) (H2/C1) The system for corrective action and followup on packaging and transportation audits and appraisals does not comply with DOE Orders.

FINDING:

- The program for quality assurance in hazardous materials container procurement, as required by DOE 5480.3, Section 9, and by 49 CFR 173.474(a)(1), is deficient. There is no effective system to ensure that the containers purchased by LLNL for packaging of hazardous materials are manufactured in conformance to the DOT specifications. Manufacturers' QA programs are not reviewed, nor are plants inspected for conformance to specification. (See Section QV.2.)

CONCERN: (PT.3-3) (H2/C1) The hazardous materials container procurement and inspection program does not provide assurance that containers will meet DOE Orders and Department of Transportation (DOT) regulations.

PT.4 REGULATORY COMPLIANCE

PERFORMANCE OBJECTIVE: All PT operations involving hazardous materials should be conducted in compliance with the applicable State and Federal regulations, including those of Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), Occupational Safety and Health Administration (OSHA), and Environmental Protection Agency (EPA).

FINDINGS:

- The system for ensuring and measuring compliance with applicable State and Federal regulations in PT of hazardous materials is ineffective. Numerous violations were noted. (See Sections PT.3, PT.6, and PT.9.)
- The program for detection of existing and potential hazards in PT of hazardous materials is not effective.
- There is no program for factoring the provisions of forthcoming DOT and EPA regulations and draft DOE 5480.3A and draft DOE 1540.X into planning for future PT operations.
- There is no program for management evaluations of LLNL use of DOE alternatives, DOT exemptions, National Security Provisions, or other regulatory variances.
- There is no documented and effective program requiring assessment of new or modified operations involving existing or potential hazards in PT, or periodic reviews of routine operations.
- See Concern PT.6-1.

CONCERN: (PT.4-1) (H2/C1) There is no comprehensive and consistent sitewide program for ensuring that packaging, identification, and transportation of hazardous materials (on site, between sites, offsite) meet Department of Transportation (DOT) and Environmental Protection Agency (EPA) regulations, as required by DOE 5480.3, Section 7.

PT.6 OPERATIONS

PERFORMANCE OBJECTIVE: Sitewide operations involving packaging and transportation of hazardous materials should be conducted in a safe, consistent, and accountable manner, following approved procedures, in conformance with applicable standards and accepted practices.

FINDINGS:

- o Operating procedures for PT are incomplete, nonspecific, or missing. (See Section PT.1.) Checklists are not routinely used. (See Section PT.3.)

- o There is no cohesive onsite PT program. (See Section PT.8.)

- o Marking and labeling of hazardous materials awaiting movement is inconsistent and not under control. A limited sampling of packages of hazardous materials revealed a startling number of violations:

  - Marking/labeling for onsite movements differ from that for offsite shipments. (See Section PT.8.)

  - At some of the buildings in the southwest area of LLNL (e.g., Bldgs. 221 and 227), the pallets are labeled instead of the drums.

  - In the Bldg. 612 yard, four drums of hazardous wastes awaiting offsite shipment were mismarked (e.g., drums marked as containing low hazard solids actually contained flammable liquids), thereby violating both DOT and EPA regulations.

  - "Onsite only" compressed gas cylinders are identified differently than cylinders that move offsite.

  - There is no reliable system to identify which gas cylinders are full and which are empty.

- o Gas cylinders are transported at the main site on an unplacarded forklift. One such operation was observed by the Appraisal Team. This forklift operates on the main thoroughfares, creating a mix of slow and fast traffic. The use of forklifts as primary transportation vehicles for hazardous materials on a multiuse site is not good industry practice, which recommends such transport only by a roadworthy vehicle. The reason given by MDD for this practice was shortage of staff; the use of both a truck and a forklift would require an additional person. A safety analysis of that operation was not performed.

- o Incoming vendor-delivered gas cylinders are not routinely inspected on receipt at Bldg. 518 for compliance with marking and labeling regulations. Several missing labels and markings were observed during this Appraisal. The defects are not routinely corrected prior to delivery on site to the users.

Some labels were so faded that they no longer showed the prescribed hazard warning colors. These incidents involve violations of 49 CFR 172.301(a), 172.304, 172.400(a), and 172.407(a)(2); DOE 5480.3, Section 7a; and DOE 1540.1. (See Section QV.3.)

- o There is no documented program to verify that legal and contractual requirements for transportation safety are being met by vendors or subcontractors.

- o See Sections PT.1, PT.2, PT.4, PT.8, PT.9, and QV.3, and Concerns RP.3-2 and RP.10-2.

CONCERN: (PT.6-1) (H2/C1) CAT. II — LLNL does not have a system for handling, identifying, and transporting packages of hazardous materials, in compliance with the safety policies and criteria prescribed in DOE 1540.1, DOE 5480.1, and DOE 5480.3, and in State and Federal regulations.

FINDINGS:

- o Development of a computerized shipping paper system (PARIS) was initiated over 5 years ago but is still not implemented. This system was to ensure that all LLNL shipping papers consistently meet the State and Federal regulations. Pending system completion, there is no central control of all hazardous materials shipping papers.

- o A recent audit of HWMD shipping manifests found numerous errors, including use of incorrect shipping names, unauthorized abbreviations, and improper hazard classifications. These documents accompany the shipments and are subject to inspection by State Police and DOT inspectors.

CONCERN: (PT.6-2) (H2/C1) CAT. II — Shipping manifests do not consistently meet the Department of Transportation (DOT) and Environmental Protection Agency (EPA) regulations in that they do not provide the required information in the specified format.

PT.8 ONSITE TRANSFERS

PERFORMANCE OBJECTIVE: Onsite transfers of hazardous materials should be conducted in a safe, consistent, and accountable manner, following approved procedures, in conformance with applicable standards and accepted safety practices.

FINDINGS:

- o There is no all inclusive LLNL onsite transportation safety program, manual, or procedure, as required by DOE directives.
- o Onsite transportation of hazardous materials does not meet the DOT regulations whenever practicable as stated in draft DOE 5480.3A and draft DOE 1540.X and the LLNL Health and Safety Manual, Section 33.41. Deviations from the DOT regulations have not been analyzed or specifically authorized. Each of the three PT organizations can make its own determinations of which DOT regulations should apply for onsite movements.
- o The safety standards for onsite transportation differ significantly from the standards for offsite shipments, particularly in the areas of packaging, marking, and labeling of packages, and selection and placarding of transport vehicles. There are also differing training requirements for drivers. (See Section PT.6.)
- o Onsite transfers of hazardous materials are made without being covered by approved procedures, and are not in conformance with applicable standards and accepted safety practices. (See Section QV.1.)
- o All vehicles used solely for onsite transportation of hazardous materials are not maintained in accordance with 49 CFR 396. Operations do not comply with 49 CFR 392. (See Section MA.1.)

CONCERN: See Concerns PT.1-1 and PT.6-1.

PT.9 OFFSITE SHIPMENTS

PERFORMANCE OBJECTIVE: Offsite shipments of hazardous materials should be conducted in a safe, consistent, and accountable manner, following approved procedures, in conformance with applicable regulations, standards, and accepted practices.

FINDINGS:

- The program and procedures for offsite shipments of hazardous materials are fragmented, uncoordinated, incomplete, and/or nonexistent, and do not comply with DOE 1540.1 and DOE 5480.3.
- Other than for controlled materials, hazardous materials are not routinely checked for compliance with DOT regulations for marking and labeling. (See Section PT.6.)
- There is no LLNL sitewide manual or set of procedures covering offsite shipments of hazardous materials. Compliance with DOE 5480.3 and the various transport regulations cannot be assured.
- In numerous instances, inspected manifests did not comply with the DOT and EPA regulations. (See Section PT.6.)
- The LLNL HSM assigns MMD responsibility for verifying regulatory compliance for offsite hazardous material shipments, including radioactive waste. However, the appraisal revealed that MMD does not perform this function for shipments by MDD or HWMD. (See Section PT.1.)
- Health and Safety Manual, Section 8.06, requires all offsite shipments via common carrier to meet DOT regulations, but provides no guidance on shipments via government vehicles.

CONCERN: See Concerns PT.1-1 and PT.6-1.

J. NUCLEAR CRITICALITY SAFETY

All five Performance Objectives were used to appraise Nuclear Criticality Safety on the main site. The facilities that were reviewed in depth included the Plutonium Facility (Bldg. 332), the Heavy Elements Facility (Bldg. 251), and the Nondestructive Evaluation Facilities (Bldg. 239). Also reviewed were the preliminary analysis and safety of proposed operations for the Uranium Separation Demonstration Project (Bldgs. 490, 491, and 492).

The Facility Safety Procedure for the Plutonium Facility was reviewed in great detail, along with most of the frequently used Operational Safety Procedures (OSPs) for workstations in the building. The OSPs for the Metal Production Line and the Engineering Demonstration System were also reviewed. A significant part of this Appraisal included interviews with Facilities Safety Officers, Health Physicists, and facility coordinators to review their interface with Criticality Safety. The Criticality Safety and Analysis Group was interviewed and review of their individual duties was conducted. Random operations in the Plutonium Facility were observed, and criticality safety limits and procedures were discussed with mechanical technicians and supervisors.

The Criticality Safety Program at the main site has been documented in Chapter 31 of the Health and Safety Manual. The organization and administration of this program is well-defined and documented. The Criticality and Safety Analysis Group performs safety functions and helps ensure that the program meets the requirements of DOE 5480.5 and ANSI/ANS 8.1-1983. A Noteworthy Practice was identified in the manner in which formal internal audits are performed.

The nuclear criticality safety evaluation identifies the parameters used to ensure subcriticality; limits are included in the OSP. A high degree of respect and understanding toward criticality safety was observed throughout the facilities reviewed by the Appraisal Team. The qualifications and experience of the Criticality and Safety Analysis Group are excellent. It was found that, although the peer review to confirm the adequacy of nuclear criticality safety evaluation is very good, it does not always include a formal documentation of the review process.

The Criticality and Safety Analysis Group determined, as a result of recent audits, that the sound levels of the criticality alarm system in Bldg. 332 do not conform with the recommendations of ANSI/ANS 8.3-1986.

CS.3 NUCLEAR CRITICALITY SAFETY EVALUATIONS

PERFORMANCE OBJECTIVE: Nuclear criticality safety evaluations of the design and operation of process equipment should ensure that subcriticality is maintained under normal and credible abnormal operating conditions.

FINDINGS:

- A review of the nuclear criticality safety evaluations performed by the Criticality and Safety Analysis Group shows a very good system supported by personnel with excellent qualifications in the nuclear criticality safety field. In some cases, however, the documentation of the independent review to confirm the adequacy of the nuclear criticality safety evaluation is too informal, consisting only of a statement that a review has taken place.
- See Concern TS.2-1.

CONCERN: (CS.3-1) (H3/C2) The criticality safety evaluations performed by the Criticality Safety and Analysis Group do not always include a formal documentation of the review process.

CS.5 CRITICALITY ALARM SYSTEM AND EMERGENCY PROCEDURES

PERFORMANCE OBJECTIVE: All reasonable steps should be taken to mitigate the consequences of a nuclear criticality accident.

FINDINGS:

- Review of the criticality alarm system in Bldg. 332 found that a test of the decibel levels for Bldg. 332 criticality horns was conducted on July 29, 1989. From the data showing the recorded sound level measurements and frequency distribution (Plan LEA 89-2715-01-B-0) it can be concluded that the sound levels of the criticality alarm system do not satisfy the recommendations of ANSI/ANS 8.3-1986 ("...sound pressure level not less than 10 db above ambient noise level..."). Review of recent audits performed by the Criticality Safety Group shows that this deficiency was addressed by the auditors.

- LLNL has received approval and funding to correct the alarm system deficiencies; a request is in place for Plant Engineering support to design, purchase, and install a new evacuation alarm module.

CONCERN: (CS.5-1) (H2/C2) The sound levels of the criticality alarm system in Bldg. 332 do not conform with the recommendations of ANSI/ANS 8.3-1986.

K. SECURITY/SAFETY INTERFACE

All four Security/Safety Interface Performance Objectives were addressed in this Appraisal. The Appraisal of the main site was accomplished through interviews of group leaders, administrators, facility managers, safety officers, department heads, and supervisors to ascertain how operations were conducted, managed, and controlled. Records and procedures were examined, and policies and practices were reviewed. In addition, visits were made to Bldgs. 111, 231, 232, 271, 321, 337, 332, 415, 482, 490, 511, and 533.

Protective Services was observed to control the site adequately during the emergency exercise conducted during this Appraisal. Protective Services provides for unhindered access to the site during such events. Protective Services participates in site safety and security drills and exercises and their subsequent critiques.

The Protective Force Division Emergency Evacuation Plan provides for orderly and unimpaired egress during a site evacuation. However, the plan does not explicitly state who will assume control of the evacuation after the Emergency Operation Center (EOC) is operational.

The responsibilities of security and facility personnel during emergencies are clearly defined in the facility emergency plans.

Those new facilities or facility modifications accomplished through the Facility Engineering Department are reviewed by representatives from security and safety. The process is such that drawings cannot be released for construction without the concurrence of Security and Safety.

There are, however, several methods by which modifications to facilities and equipment can be made without receiving a review commensurate with that of the original design.

Analyses as required by DOE 5480.16 of the potential safety consequences associated with using weapons, vehicles, and other protective force equipment in the vicinity of safety-related systems or components have not been performed, nor are currently planned.

SS.1 SECURITY/SAFETY INTERFACE

PERFORMANCE OBJECTIVE: Security/safeguards improvements and modifications should not create or increase hazards that would impede the safe, reliable operation or shutdown of any facility on the site in normal, abnormal, or emergency situations.

FINDINGS:

- o There is no documented guidance regarding the changes technicians may make to program equipment or facilities.
- o In accordance with the Whiz Tag Information Book, Whiz Tags may be used to obtain support for programmatic needs or experiments from Production Maintenance and are generally used to accomplish jobs requiring less than 16 hours to complete.
- o There are no documented criteria by which Whiz Tags are evaluated to determine if a review and approval by Security or Safety is needed prior to starting the work requested.
- o In several instances, door locks had been installed which when locked prohibited or limited egress from laboratories containing hazardous materials.

CONCERN: (SS.1-1) (H2/C2) There exist several mechanisms by which facilities and equipment may be modified without receiving a Security/Safety review to the same codes, standards and criteria afforded the original design.

SS.3 FACILITY PLANNING FOR SECURITY/SAFEGUARDS EMERGENCIES

PERFORMANCE OBJECTIVE: Safety authorities and responsibilities for all types of security/safeguards emergencies should be well defined and understood by all involved parties.

FINDINGS:

- The LLNL Protective Force Division (PFD) Emergency Evacuation Plan, December 15, 1989, provides conflicting guidance regarding who may authorize a site evacuation:
  - Section I, Introduction, states, "The Laboratory Emergency Duty Officer (LEDO) is authorized to implement an area-wide evacuation if deemed necessary after receiving a situational assessment from the Incident Commander.
  - Section III, Plan, states, "Console operator will notify the PFD Operations Sergeant in Bldg. 271 that an evacuation of the Laboratory has been issued by the appropriate department (Fire/Security) in concert with the LEDO."
- The plan states, "Until the EOC can be manned and activated, the Sergeant will inform the lead dispatcher to initiate one of the following seven appropriate evacuation plans based on the direction of the threat, time and type of work day." The plan, however, does not provide guidance as to which official will assume control of the evacuation after the EOC is declared operational.
- See Concern OA.1-1.

CONCERN: (SS.3-1) (H2/C2) The Protective Force Division Emergency Plan does not clearly establish lines of authority and responsibility under all applicable conditions.

FINDING:

- Analyses have not been performed of the potential consequences associated with using weapons, vehicles and protective force equipment in the vicinity of safety systems and hazardous materials and processes as required by DOE 5480.16.

CONCERN: (SS.3-2) (H2/C1) Safety limits have not been established as required by DOE 5480.16 for the use of security weapons and equipment near safety systems and hazardous material.

SS.4 SAFETY OF SECURITY ACTIVITIES

PERFORMANCE OBJECTIVE: Safety aspects of security activities involving use of weapons and other protective force equipment in the vicinity of safety systems and/or hazardous processes and materials should be identified and understood by all involved parties.

FINDINGS:

- o Protective Force Supervisors are trained to recognize deterioration in physical or mental condition of subordinates as a result of substance abuse; however, training is not provided to recognize deterioration in the physical or mental condition of subordinates resulting from fatigue, mental impairment, or other related causes as required by DOE 5480.16.

- o 10 CFR 1046 requires a physical fitness certification to be passed annually. A sample of the protective force training records revealed cases with an interval of as much as 15 months between subsequent certification for which extension were granted. The extension in one case was granted based on a medical evaluation that the officer was not in a physically fit state to attempt the fitness requalification.

- o The LLNL physical fitness training program does not ensure "...that security inspectors maintain the requisite physical fitness for effective job performance and to enable the individual security inspector to pass the applicable annual physical fitness requalification test without suffering any under physical injury."

- o Special Order 86-04 states the Security Emergency Response Team "... will qualify with those firearms dedicated to S.E.R.T. quarterly. This qualification is in addition to the department qualification cycles." The training records do not reflect this frequency of qualification.

- o DOE 5480.16 requires an employee to demonstrate technical and practical firearm safety semiannually to remain in an armed status. The protective force training records indicate that some officers have maintained armed status for a year by demonstrating their firearm safety proficiency twice in the same month.

- o See Section TC.1.

CONCERN: (SS.4-1) (H2/C1) The protective force training program and its implementation are not in compliance with Special Order 86-04, Security Emergency Response Team (S.E.R.T.), revised January 22, 1987, and DOE 5480.16.

FINDINGS:

- o A document specifying the content, control, and retention of training records for protective force officers does not exist.

- The protective force training records for the range master did not contain evidence of his annual cardiopulmonary resuscitation certification for the year 1989, as required by DOE 5480.16. The required documentation was sent to the range master by the Safeguards and Security Group providing the certification. The protective force training organization was not notified of the certification.

- The protective force training records for each protective force officer are not retained in a single master file. Portions of the records are retained by each of the following organizations: Basic Academy, Central Training Academy, weapons range, physical fitness, and medical.

- The state of the protective force training group records was such that the status of the protective force officers qualifications could not be determined by a review of these records.

- An annual protective force training schedule which documented the officers' qualifications, the training required to maintain the qualifications, and the planned date for the completion of the training did not exist.

CONCERN: (SS.4-2) (H3/C1) The protective force training records are not auditable, and therefore, do not provide demonstrated evidence of officer qualification in accordance with DOE 5480.16.

CONCERN: (SS.4-3) (H2/C1) The LLNL physical fitness training program for protective force officers is not in compliance with 10 CFR 1046.11.(d).

FINDINGS:

- Protective force officers receive facility-specific safety training for Bldgs. 251 and 332. However, they do not receive such training for Bldg. 331 and other buildings containing equipment and processes which present unique hazards.

- Training in addition to the general employee training is provided to protective force officers in health physics, but such training is not provided for chemical and lasers hazards which they may encounter in the execution of their duties.

- Training in the current Emergency Plan has not been provided to protective force personnel.

CONCERN: (SS.4-4) (H2/C2) Protective force officers do not receive training in the specific safety rules and hazards associated with some facilities and processes at LLNL.

L. EXPERIMENTAL ACTIVITIES

The Appraisal for the Experimental Activities category included all four Performance Objectives; Experiment Categories, which deals primarily with independent safety review of experimental proposals, is treated in additional detail in the Appraisal Section on Site/Facility Safety Review. Because of the experimental nature of much of the programmatic work at LLNL, information treated in the Operations area of this Appraisal pertains to the Experimental Activities area as well.

Because of the wide diversity of experimental programs at LLNL, the measures for reviewing experimental proposals vary between divisions. A very formal system exists in the Nuclear Chemistry Division for review of experiments proposed for the Heavy Elements Facility (Bldg. 251). The Experiment Review Committee, chaired by the Facility Manager and including other facility experts, examines and judges each proposal after formal submission in writing. This Committee interacts with the experimenter to resolve any previously unreviewed safety questions. All such issues must be resolved before approval is given to proceed with the test. A charter for the Experiment Review Committee is given in Section 9.0 of the Heavy Element Facility Handbook, M-158, Rev. 1, May 1987.

The review technique for proposed experiments in the LLNL Plutonium Facility (Bldg. 332) involves examination and approval of Operational Safety Procedures or Supplemental Operational Safety Procedures by the line managers with responsibilities as specified in the Health and Safety Manual, Appendix 2-C. In the Laser Programs, nonroutine tests, if acceptable, are approved by the Facility Manager after review by him and other resident program experts. The LLNL review process for Experimental Activities is deficient in some areas because the majority of the reviewers are not "independent," as stipulated by DOE 5480.5, Paragraph 9.h. This deficiency is treated in the Appraisal Section on Site/Facility Safety Review.

Personnel interviews with several groups of experimenters indicated established, well-defined relationships between experimenters and the operating groups. Also, discussions with the Facility Managers of all buildings that were reviewed indicated no incidents or accidents during the conduct of specially approved experiments in facility equipment.

M. SITE/FACILITY SAFETY REVIEW

All five of the Site/Facility Safety Review Performance Objectives were covered in this Appraisal. The Appraisal was conducted by interviewing the Safety Team Leaders, Administrators, facility managers, safety officers, department heads, and supervisors; and by reviewing safety committee charters, reports, inspections, and action item documentation. Bldgs. 191, 231, 232, 321, 331, 332, 482, 490, and 801, 805, 817, 827, 851, and 875 were visited.

LLNL has no fully functioning Safety Review Committee (SRC) or group of committees providing independent safety oversight as required by DOE 5482.1B. Several of the functions of the SRC are covered to some extent by other review groups. An Environment, Safety and Health (ES&H) Council to advise the LLNL Director on ES&H policies and oversee the effectiveness of activities and programs to implement these policies was recently formed; however to date, this Council has only performed limited functions relative to LLNL. The charter for this council does not address all of the functions of a SRC. This Council replaced a Health, Environment, Safety, and Quality Assurance Committee which was not proactive in pursuing safety issues.

A LLNL Assurance Office sees that some appraisals are conducted on a periodic basis. This office selects reviewers to conduct the appraisal. Results of the appraisal are transmitted to the program/facility reviewed. These in turn are responded to by the recipient and the response is assessed at the next appraisal. These appraisals however do not meet all the requirements of DOE 5450.5 and DOE 5482.16 and are not conducted in accordance with a formal, documented program.

Due to the occurrence of three Unusual Occurrence Report (UOR) incidents involving high explosives (HE) in the 6 weeks prior to this Appraisal, the LLNL Associate Director-at-Large called for a special review of activities involving HE and appointed two special committees to review HE procedures and operations for safety. At least one of the Incident Analyses indicated that the lack of an adequate peer or safety review was a contributing factor.

Multidisciplinary Safety Teams are established to discharge the responsibilities of the Hazards Control Department by assisting the facilities with safety. The LLNL Safety Teams are not entirely independent of the organizations they serve, since they provide consultation to and are funded by those same organizations. The LLNL Safety Teams are more service- than oversight-oriented; they review procedures, perform design reviews, provide technical analyses to facility and program managers, and perform building or facility inspections as part of this service.

Line management at each facility has been delegated overall safety responsibility for each facility. The Resident Manager or Associate Director annually appoints a three-person committee to perform a safety review of the facilities. No review was performed of Site 300 in 1989 or Bldg. 251 in 1988.

Many informal systems to track the status of safety issues, including closure of safety action items are in use at various facilities.

Safety items generated by Hazards Control that are outstanding for 60 days or more are placed in the Hazards Information Record and Control (HIRAC) system, a computerized database for tracking action items. Active action items can be made inactive, but not removed from the HIRAC database, by unauthorized persons.

There is no LLNL site safety event tracking system that provides for capture of safety events, screening and analysis of the events and the monitoring of the follow-up actions to ensure timely closure. LLNL has not implemented an effective follow-up system that ensures that appropriate and timely corrective actions are taken to address safety events.

Detailed investigation of significant safety events is performed to ascertain root causes, generic implications, and corrective measures.

The Department Head for Hazards Control performs a review of the LLNL Safety Teams annually. Every other year a more in-depth review is performed. There are no formal LLNL policies or requirements addressing the review of the safety review system. The review is usually initiated by an informal request from the Hazards Control Department Head to the Safety Team Leader for specific safety data and a status report. The information is informally presented to the Department Head. No formal report is issued. A formal triennial review of the safety review system for explosives operations is not conducted as required by DOE 5482.1B.

FR.1 SAFETY REVIEW COMMITTEE

PERFORMANCE OBJECTIVE: A Safety Review Committee should be available to review safety questions and the safety impacts of experiments. This committee is part of the "Contractor Independent Review and Appraisal System" specified in DOE 5480.5, or DOE 5480.6, and/or DOE 5482.1B., Section 9.d.

FINDINGS:

- There is no Safety Review Committee (SRC) as such at LLNL. Several of the functions of the SRC are covered to some extent by other review groups such as the LLNL Assurance Office.

- In his memo of January 9, 1990, the LLNL Director established an Environment, Safety and Health (ES&H) Council to advise the Director on ES&H policies and oversee the effectiveness of activities and programs to implement these policies. As of this Appraisal, the Council has only performed limited functions relative to LLNL. The charter for this Council does not address all of the functions of a SRC.

- The ES&H Council replaced the existing Health, Environment, Safety, and Quality Assurance (HESQA) Committee. The HESQA committee was charged with reviewing the health, environmental, safety, and quality assurance aspects of operations at LLNL and with making recommendations to the Director regarding policies and practices in that regard. The HESQA Committee met at varying intervals and reviewed safety issues brought before them. Minutes were kept at these meetings. The HESQA Committee was not proactive in pursuing safety or quality assurance issues.

- LLNL management may appoint special committees to review specific issues. Due to the occurrence of three UOR incidents involving high explosives (HE) in the 6 weeks prior to this Appraisal, the LLNL Associate Director-at-Large called for a special review of activities involving HE and appointed a special committee to review HE procedures and operations for safety. In at least one case the Incident Analyses indicated that the lack of an adequate peer or safety review was a contributing factor.

- Multidisciplinary LLNL Safety Teams are established to discharge the responsibilities of the Hazards Control Department by assisting the facilities with safety. The responsibilities of these Safety Teams are described in the Hazards Control Manual, revised December 1989, and in the LLNL Health and Safety Manual.

- The LLNL Safety Teams are not entirely independent of the organizations they serve in that they are funded by those same organizations. The Safety Teams are more service- than oversight-oriented; they review procedures, perform design reviews, provide technical guidance to facility managers, and participate in the self-assessment program as part of this service.

- The Safety Teams meet with different frequency and no meeting minutes are kept.

- The Resident Manager has overall safety responsibility for Site 300. He has weekly staff meetings. No meeting minutes are generated in these staff meetings, but a list of action items, including Safety Team findings, is generated. No documentation is made of the closure of safety action items. The Site 300 Safety Team Leader does keep informal track of the status, including closure, of action items.

- The Resident Manager annually appoints a three-person committee to perform a safety review of the Site 300 facilities. No review was performed in 1989.

- An annual appraisal of Bldg. 251 was not completed during 1988.

- See Sections PT.1, PT.3, FP.1, and FR.2.

CONCERN: (FR.1-1) (H2/C1) There is no fully functioning Safety Review Committee or collection of committees providing independent safety oversight for LLNL operations as required by DOE 5482.1B.

FR.2 SAFETY REVIEW TOPICS

PERFORMANCE OBJECTIVE: Items that require review by the Safety Review Committee should be well defined and understood by facility management.

FINDINGS:

- o LLNL Safety Teams may participate in selected UOR investigations. The Safety Team Leader reviews all UORs involving facilities or operations under his purview.

- o The LLNL Safety Team reviews all Facility Safety Procedures (FSPs) and Operational Safety Procedures (OSPs). The Safety Team reviews major facility or operational changes, requiring Job Orders, but not smaller changes handled with less formal work requests (the Whiz Tag System). The Whiz Tag System may involve small jobs that nevertheless may have safety significance. It is incumbent upon the requester or personnel performing the work to request a safety review for Whiz Tag System jobs. This is not routinely done.

- o LLNL Safety Teams informally become aware of procedure violations. There is no formal mechanism for notification.

- o See Section PT.1.

CONCERN: See Concerns FP.1-1, FR.1-1, MA.2-1, MA.4-1, and FP.7-1.

FR.3 OPERATION OF SAFETY REVIEW COMMITTEE

PERFORMANCE OBJECTIVE: Review of site/facility activities by the Safety Review Committee should ensure achievement of a high degree of safety.

FINDINGS:

- o A review of the OSP review and approval process as applied to several specific OSPs revealed that one of the reviewers toward the end of the review process had found safety problems that had gone undetected even though the OSPs had been reviewed and approved by representatives of industrial safety, industrial hygiene, environmental protection, fire protection, and other responsible groups.

- o Some FSPs have been extended past their expiration date, some for as much as a year, without being subject to a formal review.

- o The extension of FSP 251 expired on October 10, 1989. A memorandum further extending the FSP expiration date to April 30, 1990, was promulgated on January 29, 1990, some 3 months after the FSP expired.

- o The Incident Analyses conducted relative to three incidents (UORs) involving high explosives indicated that the lack of an adequate peer or safety review was a contributing factor.

- o See Concerns OA.5-3, OA.7-1, OP.1-2, IH.2-1, and TS.2-4.

CONCERN: (FR.3-1) (H2/C2) The conduct of the Facility Safety Procedure and Operational Safety Procedure review and approval process at LLNL is not consistent with the health and safety hazard presented by the process being considered.

FR.4 ANNUAL FACILITY SAFETY REVIEW

PERFORMANCE OBJECTIVE: An annual operating review of the facility should be performed by a committee appointed by top contractor management.

FINDINGS:

- Health and Safety Manual Supplement 1.13, Safety of Nuclear Facilities, March 1989, Appendix A, L. Internal Review and Audit, does not address all of the areas applicable to the annual appraisal as stated in DOE Section 5480.5, 9.h., specifically, items 9.h.(2), (10), and (11) are not addressed.
- See Concern QV.1-2.

CONCERN: (FR.4-1) (H3/C1) The annual appraisal guidance provided in the Health and Safety Manual is not in compliance with DOE 5480.5.

FINDINGS:

- An annual appraisal of Bldg. 231 was not completed during 1989.
- An annual appraisal of Bldg. 251 was not completed during 1988.
- The 1989 annual appraisal of Bldg. 331 and the 1988 annual appraisal of Bldg. 332 did not address all of the criteria as required under DOE 5480.5, Section 9., Contractor Independent Review and Appraisal System, specifically Section 9.h.(2), (5), (10), and (11).
- The report of the 1988 annual appraisal of Bldg. 332 did not list the records and documents reviewed, address the qualification of the reviewers, and did not identify those facilities that were inspected.
- Personnel performing annual appraisals are not obligated to review and concur with the resolution proposed for the findings of the appraisal.
- The qualifications of the appraisal team members are not documented in the annual appraisal reports in order to demonstrate technical competence in the area being appraised.
- An operating review of the laser facilities has not been conducted in accordance with DOE 5482.1B.
- See Section PT.3 and Concern QV.1-2.

CONCERN: (FR.4-2) (H2/C1) The LLNL Site Independent Review and Appraisal System is not in compliance with the requirements of DOE 5480.5, DOE 5480.1B, and generally accepted industrial practices.

FR.5 TRIENNIAL APPRAISAL OF SITE/FACILITY SAFETY REVIEW SYSTEMS

PERFORMANCE OBJECTIVE: A triennial appraisal of the safety review systems should be performed by contractor management.

FINDINGS:

- The Department Head for Hazards Control performs a review of the LLNL Safety Teams annually. Every other year a more in-depth review is performed.
- There are no formal LLNL policies or program addressing the triennial review of the safety review system as required by DOE 5482.1B.
- The review is usually initiated via an informal request from the Hazards Control Department Head to the Safety Team Leader for specific safety data and a status report. The information is informally presented to the Department Head. No formal report is issued.
- A triennial review addressing the laser program and facilities has not been performed.
- See Concerns OA.5-4 and QV.1-2.

CONCERN: (FR.5-1) (H2/C1) A formal triennial review of the safety review system for LLNL operations is not conducted as required by DOE 5482.1B and DOE 5480.5.

FR.6 OPERATING EXPERIENCE REVIEW

PERFORMANCE OBJECTIVE: Operating experience should be evaluated, and appropriate actions should be undertaken to improve safety and reliability.

FINDINGS:

- o Those safety items raised by the LLNL Safety Teams that are outstanding for 60 days or more are placed in the Hazards Information Record and Control (HIRAC) system. The HIRAC system is a computerized database for tracking action items. Active action items can be made inactive, but not removed from the HIRAC database, by unauthorized persons.
- o There is no documented program requiring that the corrective action and followup to outstanding safety items in the HIRAC system be documented.
- o The status of many outstanding safety items is maintained on informal tracking systems. Numerous items have been in an unresolved status for several years; some items date back to 1985.
- o Many of the tracking systems do not provide for the current status of the item, the person with the responsibility for the corrective action, projected closure date, and relative safety significance.
- o The annual facility reviews required under DOE 5480.5 (nuclear facilities only) and DOE 5482.1B do not address the quantity and significance of open safety items.
- o The status of all open safety items is not routinely reviewed by senior management at some facilities.
- o TSA concerns dating to September 1986 have not been closed.
- o See Concerns OA.5-1, OA.5-5, and PT.3-2.

CONCERN: (FR.6-1) (H2/C2) LLNL site management has not implemented a safety program that ensures the timely followup and closure of all safety items.

FINDINGS:

- o A documented system which provides for the evaluation and feedback of relevant operations-related occurrences to the staff did not exist at some facilities.
- o DOE UORs and industry and DOE operating experience reports are not reaching the operating staff in some facilities.
- o Safety items and issues that are resolved in less than 60 days are not included in a tracking system nor are they included in the trending and analysis performed by LLNL.
- o Required reading lists or similar mechanisms for safety and operations experience items were not used.

CONCERN: See Concern OP.6-1.

N. RADIOLOGICAL PROTECTION

This Appraisal addressed all 12 Performance Objectives in the Radiation Protection area. The Appraisal involved discussions with top-level radiation protection managers, and direct interviews with the following personnel: Hazard Control management, Health Physics group leader, Program Management, Health Physicists, Health and Safety technicians, Internal Dosimetry Program coordinator, External Dosimetry Program coordinator, LLNL Safety Team Leaders, and workers and supervisors of the Bioassay, Wholebody Counting, Respiratory Protection, and Counting Laboratories. The following buildings were visited to observe work practices, review onsite documentation, examine instrumentation and assess the status of radiological controls: 151, 175, 190, 222, 227, 231, 241, 251, 253, 298, 321, 324, 331, 332, 419, 514, and 612.

In general, LLNL is performing a commendable job in modifying the radiation protection programs in response to a changing regulatory environment. A strong foundation is being developed to incorporate many advanced techniques and state-of-the-art instrumentation. During the assessment period, the external dosimetry program received its DOE Laboratory Accreditation Program (DOELAP) accreditation. A computerized internal dosimetry code based on ICRP-30 models has been developed and all supporting documentation and procedures are under development. The Calibrations Laboratory has one of the few computerized neutron exposure systems in the United States. The Respiratory Protection, Bioassay, Wholebody Counting, and Counting Laboratories presently have or have ordered state-of-the-art equipment to upgrade their existing capabilities. The effectiveness of the ALARA Program can, in part, be measured by the small number of radiation and contamination areas. Aggressive ALARA goals have been established and are being implemented.

Although positive changes exist and the overall structure of the Radiation Program has been defined, there are still more changes that need to be made. For example, more operational and administrative procedures need to be written to provide guidance in the implementation of the programs and to control interactions among the various functional groups. There also needs to be greater emphasis on the protection and control of records. In some instances, quality records, consisting of logbooks, exposure analysis, calibration records and computer codes, are generated and maintained in an unprotected, decentralized fashion.

Perhaps the most important finding is the need to provide direct evidence of more representative air monitoring to satisfy the requirements of DOE 5480.11. Air monitoring is the key element in the internal dose control program. Air monitoring results are used to trigger more frequent bioassay measurements. Based on the routine sampling frequency and type, bioassay measurements do not permit the detection of the derived assessment level for some radionuclides. Without a strong air monitoring program, some exposures may go undetected. Plans have been made to upgrade the air monitoring program by purchasing and installing additional CAMs.

The range of energies detected by the continuous air monitors (CAMs) is broad due to the variety of radionuclides processed. This means the alarm setpoint has been increased to reduce the number of false alarms due to background radon.

Since the alarm setpoint has been increased, personnel may receive greater exposure to the airborne concentration of alpha emitters before being warned to exit the room. DOE is planning to modify the standard to permit alarm setpoints to be adjusted higher based on known background interference.

Another observation was that air samplers and monitors do not appear to be strategically placed to capture a representative sample of a potential airborne release. Breathing-zone or lapel air samplers are not used in a radiological environment at LLNL. The present placement of CAMs appears to emphasize room air monitoring rather than representative workplace monitoring.

In addition, there is no filter or dust loading absorption factor used to analyze air sample filters potentially contaminated with plutonium.

These uncertainties exist in the air monitoring program, yet personnel are permitted to wear half-face masks in certain instances while working in a plutonium facility.

In summary, LLNL has a sound general plan, well-qualified administrators, and experienced personnel; however, there are concerns in the areas of records, procedures, and documentation of an effective internal dose control program.

RP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Facility/site organization and administration should ensure effective implementation and control of radiological protection activities on the facility/site.

FINDINGS:

- o There are no written procedures for the calibration and testing of the following equipment in the counting laboratory and instrument laboratory: rotometers, alpha and gamma spectroscopy instruments, and portable air samplers.

- o There are no detailed written procedures which assign responsibilities for the transfer, accountability, and analysis of sample data to the various functional groups. These procedures are required by ANSI N13.6(b), ANSI N13.30, and DOE 1324.2.

- o Not all of the aspects of internal dosimetry program are covered by detailed procedures such as the following:

  - Some samples are prepared by the Bioassay Laboratory then transferred to the Counting Laboratory for analysis. The raw data are then transferred back to the Bioassay Laboratory for processing. Notifications are made to the Health Physicist, Internal Dosimetry Program Coordinator, and Program Management. The general process is described in Supplement 33.10 and samples are logged in and out.

  - One individual is responsible for analyzing the internal deposition data. Much of the analysis is performed by a computer model. There are written procedures which direct the processing of data and the operation of the computer system.

  - There are no procedures or notification levels indicated for informing management of significant results detected during sample analysis performed in the Counting Laboratory.

  - Quality control procedures as required by ANSI N13.30, Section 5.2.1, have not been written for the counting room.

- o See Section RP.3 and Concern OA.5-3.

CONCERN: (RP.1-1) (H2/C1) There is an insufficient number of operational and administrative procedures to provide guidance in the detailed implementation of programs and to control interactions among the various radiation protection groups.

FINDINGS:

- o There is no procedure to direct the development, approval, distribution, and revision of administrative and operational procedures. Some procedures, such as the counting of the NAD dosimeters, the operation of the swipe counters, and recordkeeping and record archiving, have no date or signature approval. There is no indication that management has reviewed and approved the manner in which work is to be conducted.

- See Sections RP.3 and RP.6 and Concerns OA.1-1 and OA.5-3.

CONCERN: (RP.1-2) (H2/C2) Administrative and operational procedures are not consistently developed, reviewed, and approved.

RP.2 INTERNAL AUDITS AND INVESTIGATIONS

PERFORMANCE OBJECTIVE: The internal audit program for both routine operations and unusual radiological occurrences should provide adequate performance assessments.

FINDINGS:

- o The QA sitewide audits of radiological activities are issue oriented. Audit teams are created to evaluate issues of current interest to LLNL. There is no general audit plan to address all radiation protection program activities.

- o Internal audits are conducted by the Hazards Control Group using the program elements listed in the Suggested Radiation Safety Checklist. The checklist does not have a detailed list of questions to ensure that each element is thoroughly covered as recommended by LLNL Quality Assurance Manual M-078-QG-2, Quality Assurance Audits, Section 4.0. The checklist does not address all of the audit elements required by DOE 5482.1B, Section 9.d., such as proposed plant modifications, proposed experiments, organization and staffing, and accident, incidents, and unusual occurrences.

- o See Concerns QA.5-4 and QV.1-2.

CONCERN: (RP.2-1) (H2/C1) Audit plans of radiological activities do not ensure that all elements are addressed, including those specified in DOE 5482.1B, Section 9.d., and DOE 5480.11, Section 9.r.

FINDING:

- o The audits conducted by the Hazards Control Group are not independent. Audits are conducted by personnel responsible for developing and implementing the LLNL Radiation Program.

CONCERN: (RP.2-2) (H3/C2) There is very little independence in internal radiation protection audit programs.

RP.3 RADIOLOGICAL PROTECTION PROCEDURES AND POSTING

PERFORMANCE OBJECTIVE: Radiation protection procedures for the control and use of radioactive materials and radiation generating devices should provide for safe operations and for clearly identified areas of potential consequences.

FINDING:
- o The implementation of DOE Orders, in some cases, cannot be traced to the operating level. Facility Safety Procedures and Operational Safety Procedures are traceable.

CONCERN: See Concerns RP.1-1 and RP.1-2.

FINDINGS:
- o The radiation work permit (RWP) does not include provisions for stating the radiological conditions of the worksite. It is also noted that the RWP states "WORK PERMIT."
- o See Concern OA.5-3.

CONCERN: (RP.3-1) (H2/C2) The radiation work permit does not provide information to the worker on the radiological environment of the workplace.

FINDINGS:
- o Radiation protection procedures and instructions consisting of FSPs, OSPs, RWPs, and Discipline Action Plans (DAPs) provide guidance on conducting radiation protection activities at LLNL. The operational radiation protection procedures are primarily contained in the DAP. DAPs provide building-specific instructions on the routine activities conducted by the Health and Safety Technicians. The instructions in the DAP are a listing of general actions or activities rather than step-by-step instructions.
- o Some instructions are outdated. Instruction number HP-5 was posted near the swipe counter of Bldg. 332 and dated January 10, 1986. This instruction has been superceded by HP-6. The procedure for the calibration of the Giraffe air sampler had a 1976 date. Many of the procedures had no date or signature approval.

CONCERN: See RP.1-1 and RP.1-2.

FINDINGS:
- o Controlled Area signs in Bldgs. 6196 and 6197 are not conspicuously posted as required by DOE 5480.11, Section 9.k. The signs are located inside of the door frame opening.
- o The controlled area sign for Bldg. 6198 was missing. The sign was reportedly located on a portable stanchion. The stanchion could not be located.
- o A "radiation area" tape was used to define a controlled area at Bldg. 612.

- o Waste accumulation area signs containing no radiological markings are used to identify areas where radioactive material is stored at Bldg. 175.

- o Drums and containers containing radwaste are not properly posted. No radiological labels are on the transuranic (TRU) waste container in Bldg. 332. Waste containers in the waste accumulation areas do not have radiological information affixed to them. Radiological information is contained on the shipping form located in a plastic pouch on the side of the container. The papers are removed from the pouch and sent to shipping for approval. During this period, no radiological information is available on the container.

- o See Concern PT.6-1.

CONCERN: (RP.3-2) (H1/C1) Radwaste containers and some controlled areas are not properly posted in accordance with DOE 5480.11.

RP.6 INTERNAL RADIATION EXPOSURE CONTROL PROGRAM

PERFORMANCE OBJECTIVE: Internal radiation exposure controls should minimize internal exposures.

FINDINGS:

- Two situations were identified in LLNL which may provide workers a false sense of protection from internal deposition while working around radioactive materials:
  - Half-face masks are worn while conducting some work activities in a potentially airborne radioactive environment. The "Guide to Good Practices" at Plutonium Facilities (P4-15) states that masks should be used for all bag-out, bag and glove changes, and any situation involving a potential or actual breach of containment. Full face masks are recommended. In accordance with Facility Safety Procedure Appendix D for Bldg. 332, half-face masks are permitted during "bag-in" and "bag-out" procedures.
  - Workers wearing half-face masks were observed conducting plutonium-related activities in an enclosure at a down-draft table which was contaminated with plutonium. This is permitted by OSP 332.41 Section 5.3.9.
  - The second situation was work being performed in fume hoods with high face velocities. The range of hood airflow velocities, as specified in the LLNL Industrial Hygiene standard, is to be 125 to 150 feet per minute. Hood airflow velocities were observed to be measured and accepted at velocities up to 200 feet per minute. These high velocities can cause a partial vacuum to be created in front of the worker, and the contaminated air inside of the hood may be drawn out into the breathing zone.
- See Section RP.7.

CONCERN: (RP.6-1) (H2/C2) LLNL practices such as wearing half-face masks and permitting high hood airflow velocities may not properly control potential internal radiation exposures.

FINDING:

- ANSI Z88.2 (Section 8.3) requires that respirators stored for emergency use be inspected monthly. This standard requires a physical examination of the equipment. Based on records posted at the emergency self-contained breathing apparatus stored in Bldg. 332, the monthly inspection consists of observing that the cylinder pressure is within range.

CONCERN: (RP.6-2) (H2/C1) Emergency respirator protection equipment is not being properly inspected in accordance with ANSI Z88.2.

FINDING: o Outdated respirators were found in storage areas in Bldgs. 175, 251, and 332.

CONCERN: See Concern IH.5-2.

FINDING: o General internal dosimetry policies and procedures are contained in the LLNL Internal Dosimetry Program Manual. Technical dosimetry information is contained in the draft copy of Technical Basis for Internal Dosimetry at LLNL. There are no procedures available to instruct personnel in the use of the collected data, the technical basis document, and computer system to calculate dose when significant internal exposures occur.

CONCERN: See Concern RP.1-2.

RP.7 INTERNAL RADIATION DOSIMETRY

PERFORMANCE OBJECTIVE: The internal radiation dosimetry program should ensure that personnel radiation exposures are accurately determined and recorded.

FINDINGS:

- The frequency and type of routine bioassay sampling does not permit the detection of 0.1 rem annual effective dose for some radionuclides. Urine bioassay samples are collected and analyzed on a semiannual basis. This frequency does not provide the sensitivity to detect certain radionuclides such as plutonium at the 0.1 rem level. For example, the DAL for Pu (weapons grade) is 4.5×10^{-3} dpm per 24 hour sample at a 6-month frequency while the minimum detectable activity is 3.0×10^{-2} dpm per 24-hour sample.
- Fecal bioassay sampling is not routine. Such sampling is conducted only during known or suspected uptakes.
- LLNL personnel indicated that air monitoring is used to establish possible uptake and to trigger more frequent bioassay measurement.
- See Section RP.9 and Concerns RP.6-1 and RP.9-1.

CONCERN: (RP.7-1) (H2/C1) The bioassay sampling frequency and type, in combination with the air monitoring program, may not detect internal exposures to all radionuclides at the levels specified in the DOE draft Performance Standards for Internal Dosimetry Programs.

FINDINGS:

- The quality assurance and quality control programs for the Wholebody Counting and Counting Laboratories are being updated to meet the requirements of ANSI N13.30 (Section 5.0).
- See Concern QV.1-1.

CONCERN: (RP.7-2) (H2/C2) The LLNL internal radiation dosimetry program does not meet the requirements of ANSI N13.30 for quality assurance and quality control.

RP.8 FIXED AND PORTABLE INSTRUMENTATION

PERFORMANCE OBJECTIVE: Personnel dosimetry and radiological protection instrumentation used to obtain measurements of radioactivity should be calibrated, used, and maintained so that results are accurately determined.

FINDINGS:

- o The calibration and maintenance of fixed and portable instrumentation does not satisfy all parts of the ANSI Standard. Exemption requests for some specifications were submitted on April 17, 1989, and November 8, 1989. No responses to the exemption requests have been issued. The following are examples of specific findings which do not satisfy ANSI Standards or good industry practices:
  - Dose rate instruments are not source checked before each use as recommended by ANSI N323 (Sections 4.73 and 4.6). Check source devices are on order for these instruments.
  - Instruments are not labeled with the response to a given check source immediately following calibration as required by ANSI N323 (Sections 3 and 4.6) and this source may not be used with that instrument as required by Section 4.5(5) in the field.
  - Efficiency checks are conducted in the field rather than the $\pm$ 20 percent response to the check source as required by ANSI N323 (Section 4.6). There is also no limit specified for determining when the instrument is out of calibration.
  - The method of developing transfer instruments does not satisfy the $\pm$ 2 percent reproducibility requirement of ANSI N323 (Sections 5.1(1) and (2)) for the remmeter.
- o Other miscellaneous findings associated with instrumentation follow:
  - Procedures do not address tagging out defective equipment or determining the impact of operating with out-of-calibration equipment upon discovery.
  - The "Operating Instruction" for the "Giraffe" air samplers only requires more oil to be added to maintain pump oil levels. The manufacturer recommends changing the oil and flushing the pump periodically. There is no well-defined preventive maintenance program for air samplers.
  - The mechanical timer associated with the "Giraffe" air sampler is not calibrated or tested for accuracy. An error in the collection time could lead to errors in determining airborne concentrations.
  - There is no definite recalibration frequency specified for the air samplers in the "Operating Instruction." The instruction states: "approximately once a year."

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  - The mechanical timer associated with the "Giraffe" air sampler is not calibrated or tested for accuracy. An error in the collection time could lead to errors in determining airborne concentrations.

  - There is no definite recalibration frequency specified for the air samplers in the "Operating Instruction." The instruction states: "approximately once a year."

- The "Operating Instruction" also does not require calibration before first use.

- There were long overdue calibration stickers attached to the air samplers and rotometers stored in the Instrument Laboratory.

- The date on the calibration sticker was erased and redated on an air sampler in the Instrument Laboratory.

o See Concern QV.4-1 and Sections MA.2 and RP.9.

CONCERN: (RP.8-1) (H2/C2) The calibration and maintenance for some of the fixed and portable instrumentation do not satisfy all requirements in ANSI Standards and good industry practices.

RP.9 AIR MONITORING

PERFORMANCE OBJECTIVE: Air monitoring systems through selection, location, calibration, and maintenance should ensure reliable estimates of air activity for radiological control purposes.

FINDING: o The following observations were noted on the air monitoring systems for the internal exposure control program:

- The maintenance and calibration program for some air sampling and analysis does not satisfy ANSI Standards and good industry practices. (See Concern RP.8-1.)

- The passive air sampler and continuous air monitors (CAMs) do not appear to be properly placed to ensure the collection of a representative workplace air sample. An air flow characterization study was provided for one facility, Bldg. 332. The study indicated that airflow patterns were unpredictable and recommended placement of CAMs near the room exhaust. The study only considered the placement of CAMs and not the passive air sampler.

- The present CAM placement (generally near the room exhaust) tends to emphasize general air monitoring rather than representative workplace monitoring.

- No breathing zone air samplers are used in the radiation environment. Breathing zone air samplers can provide more definitive information on the airborne concentrations experienced by an individual worker.

- There is no alpha or beta absorption factor used in the analysis of swipe and air sample filters.

- The CAMs are not set to alarm at less than 8 DAC-hours of exposure as required by DOE 5480.11. DOE is planning to modify the standard to permit alarm setpoints to be adjusted higher based on known background interference.

CONCERN: (RP.9-1) (H1/C1) The air monitoring systems may not reliably provide the information needed for an effective internal dose control program.

RP.10 RADIATION MONITORING/CONTAMINATION CONTROL

PERFORMANCE OBJECTIVE: The radiation monitoring and contamination control program should ensure worker protection from radiation exposure.

FINDINGS:

- o Some of the general radiation practices do not ensure control of contamination. The following examples were noted:
  - Three pairs of torn shoe covers were worn repeatedly in Bldg. 251.
  - Radioactive liquid standards were stored in glass on a high shelf in the Analytical Laboratory, requiring the use of a stool in order to remove them. The liquid was stored without absorbent material.
  - A can containing UO_2 indicated a dose rate reading of 10 mrem/hr as read by the GM instrument. The reading was reverified with an ion chamber to read 2.5 mrem/hr. There was no indication of the dose rate on the can. The user also was not informed about the dose rate.
  - A hood in the Analytical Laboratory has a sink which drained to the sanitary sewer system. Radioactive material was stored in the hood.
  - Radioactive waste containers were not labeled with a radiation sticker or expected dose rate.
  - A radiation label was found in sanitary trash at Bldg. 175.
- o See Concern OA.5-3.

CONCERN: (RP.10-1) (H2/C2) Some work practices in a radiation environment do not ensure proper radiation control.

FINDINGS:

- o The October 1, 1986, instructions above the swipe counter indicate that if the area wiped is significantly less than 100 cm^2, the swipe must be read with a swipe counter. The minimum detectable activity (MDA) for the counter is approximately 20 dpm assuming a 20 percent efficiency. The release limit on smearable alpha contamination is 20 dpm/100 cm^2. Any reduction in the area smeared would decrease the detection capability of the instrument below the release limit.
- o There is no lower limit specified for the efficiency of the swipe counter. The Swipe Counting Manual indicates an efficiency of "approximately 10 percent" for alpha. If the efficiency were 10 percent, then the MDA would be 40 dpm.
- o See Concern OA.5-3 and Section PT.6.

CONCERN: Swipe counting procedures may allow the release of equipment above
(RP.10-2) the smearable release limit specified in DOE 5480.11.
(H2/C1)

RP.11 ALARA PROGRAM

PERFORMANCE OBJECTIVE: A formally structured, auditable program should be in place with estimated milestones to ensure that exposures are maintained as low as reasonably achievable (ALARA).

FINDINGS:

- o A member of the LLNL Safety Team was observed using a dolly carrying a number of shipping canisters containing radioactive materials to record data.
- o An excessive distance was permitted for air transfer from the shipping cask to the glovebox.
- o The hands were in contact with the samples during the removal of the sample containers from the plastic bags.

CONCERN: (RP.11-1) (H2/C2) The ALARA principles were not incorporated during the handling and processing of the samples.

RP.12 RECORDS

PERFORMANCE OBJECTIVE: Records related to occupational radiation exposure should be maintained in a manner that permits easy retrievability, allows trend analysis, and aids in the protection of an individual and control of radiation exposure.

FINDINGS:

- Some occupational radiation exposure records such as logbooks, exposure analyses, calibration records, and computer codes are maintained in an unprotected, decentralized fashion.
- There is no centralized system or procedure for ensuring that all occupational radiation exposure records are properly collected, stored, and retained.
- Portable survey instrument calibration procedures indicate that the records should be maintained for 5 years, then added to the history file for the instrument.
- The IH Instrument QA Manual states that unless otherwise specified in writing, all records are to be kept for a period of not less than 30 years.

CONCERN: (RP.12-1) (H3/C2) Occupational radiation exposure records are not collected, stored, and retained in accordance with a uniform procedure or system.

O. INDUSTRIAL HYGIENE

This Appraisal addresses all six Performance Objectives in the Industrial Hygiene area. The Appraisal of the industrial hygiene program included review of program documentation, technical information exchange, and validation of performance. Review of the industrial hygiene program documentation included LLNL policies, procedures, and program documentation such as technical manuals. The adequacy of technical and technical/management information exchange was assessed by selective review of consultant and internal reports, DOE-SAN and LLNL self-assessment appraisals, available technical data such as chemical exposure monitoring reports, and interdepartmental correspondence. Interviews with industrial hygiene and safety personnel, medical staff, line management, research and crafts staff members; facility orientation tours; audits of records; observation of an emergency drill; and specific worksite visits were used to identify and/or validate LLNL performance in various program areas. There is considerable overlap in Industrial Hygiene (IH) and Occupational Safety (OS) Programs; to avoid redundancy in assessment and reporting, the IH and OS sections of this Appraisal should be considered an overall assessment of the nonradiological personnel protection programs at LLNL. Findings and/or concerns noted in either the OS or IH program are applicable to the overall LLNL Personnel Protection Program.

The 47 facilities inspected were selected to permit observation of various operational activities including laboratory research, crafts shops and support facilities, and unique applied technology (e.g., the High Explosive Applications Facility). The facilities inspected were determined to adequately represent the scope of operations and potential hazards at LLNL. Facilities inspected included the following locations: Bldgs. 221, 222, 223, 224, 225, 277, 175, 331, 322, 329, 292, 197, 332, 151, 361, 365, 366, 432, 242, 865, 827, 826, 825, 852, 801, 851, 817, 873, 876, 875, 879, 874, 871, 899, 828, 806, 810, 805, and 191.

The main site industrial hygiene program is clearly and appropriately demonstrated to be a line management responsibility. The matrix management system resulted in line accountability for essentially every operational activity including Site 300. Operational activities at Site 300 along with several main site activities were in an "operational standdown" that precluded formal operational task analysis for some operations during the assessment period. Therefore, the Site 300 personnel protection program review was integrated into the concurrent assessment of industrial hygiene and occupational safety programs at the main site. All findings and concerns identified were equally applicable to Site 300 and the main site.

Several concerns identified during the Appraisal warrant implementation of corrective action to enhance specific elements of the industrial hygiene program. One of the more significant concerns identified during the Appraisal involves the need for additional specialized training for the Health and Safety Technicians. This concern has been identified by LLNL and a corrective action plan has been developed along with a new training program. Another significant concern relates to the need for a sitewide health hazard evaluation and control program. Finally, a concern was noted regarding compliance with all the stated provisions of the Hazard Communication Standard, 29 CFR 1910.1200.

The major causal factors of the current deficiencies can be summarized in three general categories as follows:

- o Lack of effective independent oversight of program health and safety-related activities,

- o Lack of consistency between program divisions for health and safety implementation, and

- o Lack of early and mandatory involvement of technical health and safety personnel in operational/research activities.

In summary, line management appropriately assumes accountability for industrial hygiene responsibilities. The LLNL industrial hygiene program is staffed by technically qualified support personnel who have been effective in developing and implementing programs within the limitations of available resources. Moreover, there is no evidence of acute or chronic disease in the LLNL population due to exposures to chemical or physical agents in excess of that observed in similar operations elsewhere. The industrial hygiene program has been effective in ensuring employees are provided a generally safe and healthful workplace.

IH.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Site and facility organization and administration should ensure effective implementation and control of the industrial hygiene program.

FINDINGS:

- The Industrial Hygiene (IH) technical staff requirement is currently estimated by LLNL to require approximately 15 FTE positions. Currently, 3 of the 15 FTE positions are vacant and 2 additional staff member has accepted an intradivision transfer to another organization, resulting in 5 of 15 FTE vacancies in the IH organization.

- Plans are being made to fill the open positions in the Industrial Hygiene organizations as soon as possible. The availability of professional industrial hygiene support is important, considering the technical and training responsibilities assigned to the staff industrial hygienist.

CONCERN: (IH.1-1) (H2/C2) Industrial hygiene professional support to the Health and Safety Teams has not been sufficient to ensure effective identification and control of potential health hazards in the workplace.

FINDINGS:

- Implementation of IH program elements, such as routine personal employee monitoring, is commonly delegated to facility Health and Safety Technicians (HSTs). The HSTs are similarly relied upon to support other health and safety program elements. Specialized training provided to the HSTs has not been sufficient to ensure a consistent and effective Health and Safety Protection program throughout the facility. Revisions to the HST training program have been developed and are expected to be fully implemented by the end of FY 90.

- Twenty percent of the HSTs have not completed the advanced Health and Safety Training course. In addition, necessary retraining of the majority of the technicians has yet to be completed to ensure effective implementation of the industrial hygiene program.

CONCERN: (IH.1-2) (H2/C2) A significant number of Health and Safety Technicians have not been provided sufficient industrial hygiene training to ensure consistent implementation of the industrial hygiene program.

FINDINGS:

- There is evidence of insufficient early and/or mandatory involvement of technical health and safety personnel in routine operational/research activities. The following examples illustrate typical activities observed that reflect a lack of direct technical health and safety review and/or participation:

  - A bank of compressed air cylinders had been placed in use as breathing air without assurance that the air met Grade "D" criteria as required for breathing purposes.

- An exhaust ventilation hood was being constructed in the welding shop for which there had been no disciplined review; the hood did not meet American Conference of Governmental Industrial Hygienists (ACGIH) Ventilation Manual requirements (DOE-prescribed standard).

- Environmental assessment personnel responding to hazardous material incidents do not have the training required by OSHA (29 CFR 1910.120).

- Industrial hygiene personnel monitoring, in the machine shop of Bldg. 151, was not completed as recommended by good practice guidelines and prescribed by DOE 5480.10. The assigned technician did not provide necessary calibration of the sampling train during the course of a 4-week-long workplace evaluation.

o LLNL has published excellent reference documents such as the Health and Safety Manual and its associated Supplements; however, these documents require knowledgeable application guidance by technical health and safety personnel to assure compliance with their intent.

CONCERN: (IH.1-3) (H2/C1) Health and Safety Technicians are not sufficiently involved in routine operational research activities to minimize potential hazards or monitor the effectiveness of controls.

FINDINGS:

o LLNL has clearly and appropriately assigned health and safety program implementation as a line management responsibility. The LLNL matrix management system inherently results in two lines of management accountability; specifically, the Program (e.g., funding organization) and Program Support (e.g., LLNL work force) management lines. Since each "Project" at LLNL has an essentially unique matrix organizational makeup, each "Project" has unique line management structures.

o LLNL personnel routinely perform work in multiple facilities and on/for various programs; it is common for some work to be performed in such a manner on a daily basis.

o The LLNL IH program resources are a component of the Hazards Control Division and serve LLNL organizational units as technical consultants. IH is a component of the LLNL Safety Teams which serve as the principal coordinating unit for technical health and safety support services to various facilities. LLNL "programs" or "projects" may be served by multiple Safety Teams if several facilities are involved. The IH personnel, like all members of the Safety Teams, support but do not direct implementation of health and safety programs on an operational basis.

- o Observations during the assessment period indicated significant differences in the implementation of specific health and safety program elements on a project-by-project and facility-by- facility basis. Examples include:

  - Implementation of the Hazard Communication Program (e.g., practices regarding use of facility/room posters for hazard inventory/identification; location, source, and completeness of Materials Safety Data Sheets (MSDSs) for chemical inventories; level of employee awareness of potential chemical hazards). The LLNL construction safety program had not included implementation of the hazard communication requirements of 29 CFR 1910.1200, although it is an OSHA-prescribed construction industry standard.

  - Implementation of the Respiratory Protection Program for employees assigned to the Laser Program utilizes relatively stringent operational controls and well-defined lines of communication and approval procedures. In contrast, the Hazardous Waste Management operation utilized relatively ineffective program controls, accountability, or approvals for personnel usage.

- o Within the Hazards Control Division, several permit systems have been implemented to assist in the implementation of hazard controls at LLNL. These include, but are not limited to, permits for confined space entries (e.g., potential oxygen for deficiency and/or toxic gas exposure) and high fire risks (e.g., welding, open burning, use of flammable gases). The permit for high fire risks is called a "Hazardous Work Permit," but is limited only to fire risks; there is no coordination of this generically titled permit to other significant potential hazards.

- o See Concern OA.5-3.

CONCERN: (IH.1-4) (H2/C2) LLNL does not have controls or effective procedures in place to facilitate consistent interpretation and implementation of the industrial hygiene program across organizational units.

IH.2 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Procedures and documentation should provide appropriate direction, record generation, and support for the industrial hygiene program.

FINDINGS:

- o A sitewide ALARA policy for nonradiological health hazards has been developed and implemented by LLNL.

- o The main site health and safety policies are delineated in the Health and Safety Manual. Facility Safety Procedures (FSPs) or Operational Safety Procedures (OSPs) are prepared for specialized activities or operations which have potentially significant health hazards. LLNL has not developed OSPs as required for some potentially hazardous operations. For example, in Bldg. 222, Room 1117, methylene dianiline, a suspected carcinogen, was stored without an OSP or evaluation in place.

- o Industrial hygiene sampling equipment and air cleaning devices are maintained according to manufacturer specifications and accepted operational guidelines. Contrary to DOE 5480.10, documentation of calibration and maintenance procedures has not been provided for industrial hygiene equipment used throughout the main site.

- o See Sections FR.3 and OA.5.

CONCERN: (IH.2-1) (H2/C1) LLNL has not consistently implemented operational safety procedures to ensure that potential employee exposures to chemical and physical agents are maintained at levels consistent with the ALARA goals for the main site or with DOE 5480.10.

IH.3 MANAGEMENT OF HEALTH CONCERNS

PERFORMANCE OBJECTIVE: Chemical, biological, physical, and/or other environmental stresses arising in the work place should be identified, evaluated, and controlled.

FINDINGS:

- Many workplace operational activities have formally completed thorough and comprehensive health hazard inventories. However, contrary to the requirements of DOE 5480.10, some health hazard inventories have not been prepared for main site operations which may involve potential employee exposure to physical, chemical, and biological agents.

- The main site industrial hygiene staff and Health and Safety Technicians have assigned responsibilities for characterizing the extent of the health hazard using appropriate professional judgment and analytical sampling methods.

- A total of about 19,000 samples a year are analyzed by the Industrial Hygiene analytical laboratory. Most of the analytical work is completed in support of the R-Program employee surveillance program (10,000 samples). Analysis of beryllium swipes and area samples (5,000 samples) is also a high priority of the analytical laboratory. The remaining samples are analyzed in support of the ongoing industrial hygiene program or the environmental monitoring and surveillance program.

- Several operations at the main site involving the use of potentially hazardous chemical or physical agents were not monitored to establish baseline exposure levels or validate the operational effectiveness of engineering controls. Areas to be evaluated include, but are not limited to, the following operations:

  - Salt leaching operation using Butyl alcohol in Bldg. 222, Room 1015,

  - Silver soldering operations located in the basement of Bldg. 151, and

  - Generation of an electromagnetic field near a test station located in Bldg. 131, Room 1432.

- Employees who are in the personnel monitoring program are notified through the line supervisor. Exposures in excess of the allowable OSHA standards are directly forwarded to the Medical Department for inclusion into the individuals medical record.

- o Contrary to DOE 5480.10, industrial health hazard evaluations and exposure data are not readily accessible to the Occupational Medical Department, with the exception of the R-Program. LLNL is currently developing a data management system to enhance the exchange of information and provide a basis for necessary trending work of industrial hygiene records.

- o See Sections EP.7 and OP.1.

CONCERN: (IH.3-1) (H2/C1) LLNL has not implemented a uniform health hazard evaluation, control, and tracking program for potential sitewide health hazards.

FINDINGS:

- o The Hazards Control Department initiated a sitewide study evaluating the use of different types of personal protective control devices (i.e., respirators, gloves, laboratory coats, coveralls, etc.), specified for sitewide protection involving potentially toxic chemical operations.

- o Several potential areas of concern involving the use of protective clothing were identified during the Appraisal. Examples include, but are not limited to, the following:

  - Shop coats and shoe coverings in the beryllium (Be) operations of Bldg. 321, and

  - Protective gloves recommended for use in solvent operations in Bldg. 222, Room 1024.

- o The draft DOE 5480.10 addresses specific requirements for the use of protective clothing for Be operations.

CONCERN: (IH.3-2) (H2/C2) Operations at LLNL involving potential exposure to toxic agents and chemical carcinogens [i.e., metals (Be), solvents, and amine-based curing agents] are not evaluated in light of current personal protective equipment guidelines.

IH.4 SURVEILLANCE OF HEALTH CONCERNS

PERFORMANCE OBJECTIVE: Appropriate surveillance of activities should be conducted to measure industrial hygiene performance and ensure the continued effectiveness of controls.

FINDINGS:

- o Exhaust ventilation systems are surveyed on a scheduled basis. The frequency for the evaluations is scheduled based on the assigned hazard potential rating; i.e., high hazard exhaust ventilation systems are evaluated quarterly, and monthly smoke tests; low hazard exhaust ventilation hoods are evaluated yearly, and monthly smoke tests. Acceptance labels are generally posted on the front of the exhaust ventilation system.

- o Several chemical fume hoods evaluated during the Appraisal are equipped with visual indicators of operational performance. Visual indicators are used on several new hood installations and laboratory fume hoods which require the use of chemical carcinogens. Implementation of a consistent program for the use of the visual indicators was not evident in operations reviewed during the Appraisal.

CONCERN: (IH.4-1) (H2/C2) The main site has not developed criteria for continuous performance-based indicators for high hazard exhaust ventilation systems.

IH.5 COMPLIANCE WITH OCCUPATIONAL HEALTH STANDARDS

PERFORMANCE OBJECTIVE: Site/facility operations comply with DOE-prescribed standards for the evaluation and control of occupational health standards.

FINDINGS:

- o LLNL asbestos abatement procedures require the use of ongoing controls to ensure that exposures are maintained below both the recommended OSHA compliance level and the internal ALARA goal for the facility. There was one instance observed where vinyl asbestos floor tile was removed contrary to the internal LLNL asbestos abatement procedures. Vinyl asbestos tile was removed in Bldg. 331, Room 135, without use of appropriate controls or recommended asbestos disposal practices. (Tile being removed was subject to specific radiological waste disposal procedures.)

- o A quantity of vinyl asbestos tile was found in a main site dumpster. The tile had been disposed of in the dumpster without the use of approved containment prescribed in the LLNL asbestos abatement procedure. There was no indication regarding the origin of the tile.

- o LLNL is conducting a field study to evaluate the significance of potential exposure to asbestos-containing materials used during maintenance performed on vinyl asbestos tile floor surfaces. No exposure information was available for employees who were involved in the two incidents referenced above.

CONCERN: (IH.5-1) (H2/C2) The LLNL implementation of a comprehensive asbestos control program is not consistent with internal LLNL guidelines and requirements of the ALARA program.

FINDINGS:

- o Documentation and technical aspects of the respirator protection program are appraised annually by internal and external experts consistent with the provisions of the prescribed DOE Standard, ANSI Z88.2. However, the Appraisal program does not include an in-depth evaluation of the usage and workplace practices of respirators used throughout the main site.

- o Several respirator program deficiencies were observed during the review. Specific examples are listed below:

  - Three respirators were found in a storage cabinet in Bldg. 331. The timely return of respirators is not consistent with LLNL operational respiratory protection procedures.

  - A box of 3M 8710 respirators was observed on a bench top located near dust-producing operations in the high-bay area of Bldg. 131. There was no indication of the assigned responsibility for approval for use of the respirators as required by the prescribed standard ANSI Z88.2.

- A respirator storage area in Bldg. 611 was not controlled as recommended in the internal respiratory protection guidelines.

o A program has been initiated to review workplace implementation of the LLNL respiratory protection program. Comprehensive reviews of the respiratory program have been completed in Bldgs. 332, 175, and 177. Plans have been made to complete the comprehensive review of the respirator program for the remainder of the main site by the end of FY 91.

o See Section RP.6.

CONCERN: (IH.5-2) (H2/C2) LLNL has not completed a sitewide review of respirator usage, as recommended in the prescribed DOE standard, ANSI Z88.2.

IH.6 PERSONNEL COMMUNICATION PROGRAM

PERFORMANCE OBJECTIVE: Site/facility personnel should be adequately informed of chemical and biological stresses that may be encountered in their work environment.

FINDINGS:

- LLNL has not implemented an effective program for the receipt and distribution of Materials Safety Data Sheets (MSDSs) at LLNL. Accessibility and availability of MSDS in selected areas was not consistent throughout LLNL. An example of the need for an effective receipt and distribution program was observed in HEAF (Bldg. 191). Near machine shop 1140, a table reference library contained over 15 volumes of MSDSs; few of which reflected materials actually in the shop. The first two trade name products (Kool Mist and Mobil 350) picked up in the work area did not have MSDSs available. These materials are common machine cutting/cooling oils and are in daily use.

- Inventory control is also essential to effective chemical hazard management. For example, LLNL has a dating and shelf life policy for peroxidizable materials (such materials potentially form unstable chemical compounds); however, an undated bottle of tetrahydrofuran was observed in Bldg. 827-C. The bottle had exceeded LLNL-prescribed shelf lives for both opened (shorter life) and unopened containers. It was unsafe to test the cap to determine if the bottle had previously been opened.

- The inventory of chemicals and chemical compounds subject to some regulatory identification and management requirements at LLNL is in the thousands. In addition to OSHA standards for employee hazard communication, EPA standards (e.g., SARA Title III) require very specific "community right to know" reporting.

- LLNL has assembled a "task force" to identify needs and recommend chemical inventory and information management action plans; a draft document has been prepared and is waiting management review. LLNL has been aware of general chemical inventory management information needs, and promulgating standards, since the early 1980s.

- A significant number of chemical containers were not labeled as to content or did not have appropriate hazard warning information. In Bldgs. 241, 231, and 321, for example, beryllium operations and containers used a label stating "Contains Beryllium." However, the LLNL Health and Safety Manual Supplement 21.10 for beryllium recommends the use of a label to warn of the long-term health effects associated with beryllium exposure, particularly the potential for respiratory effects.

- Several different types of labels were used to identify hazardous chemicals in the workplace.

- o A number of employees interviewed did not have a specific knowledge of health hazards or measures to protect themselves from chemicals they used routinely.

CONCERN: (IH.6-1) (H2/C2) LLNL has not fully implemented all elements of the OSHA Hazard Communication Standard, 29 CFR 1910.1200, particularly those aspects of the Standard related to availability of Materials Safety Data Sheet (MSDS) labeling requirements, and maintenance of chemical inventory.

P. OCCUPATIONAL SAFETY

The Occupational Safety portion of this Appraisal addressed all six Performance Objectives for the Occupational Safety area. The information developed during the course of the Appraisal resulted from personal observations, reviews of existing documentation, and interviews of staff and operating personnel. Input from the associated OSHA Appraisal provided additional insight into the state of safety programs at LLNL.

During the Appraisal, walkthrough inspections were conducted in Bldgs. 125, 161, 162, 171, 175, 177, 179, 191, 197, 214, 232, 292, 310, 312, 321, 322, 326, 327, 329, 332, 335, 411, 418, 490, 511, 516, 520, 611, 624, 801, 805, 806, 810, 817, 825, 826, 827, 828, 851, 852, 863, 871, 873, 874, 875, 876, 879, 899, 4177, and 4230. Facilities inspected included maintenance areas, laboratory areas, program areas, and administrative areas. Documentation reviewed included laboratory manuals, Facility Operating Procedures, Operational Safety Procedures, technical reports, and LLNL self-assessment appraisals in addition to LLNL correspondence. Interviews conducted involved both technical personnel from the safety-related disciplines and representatives from the facilities and related programs.

One of the Appraisal Team's findings in Organization and Administration relates to the concept of independent oversight for health and safety-related activities. The current LLNL Safety Team concept did not provide the necessary level of independent oversight. A second concern addressed errors in the data going into the OSHA Log 200 form. There are insufficient controls to assure that the data going into the report are correct.

In the Performance Objective of procedures and documentation, the LLNL system consisting of the Health and Safety Manual, Supplements, Facility Operating Procedures, and Operational Safety Procedures was found to be very appropriate. Several situations were observed, however, where the system had not been fully implemented. One situation involved the lack of documented procedures in the vehicle maintenance area.

In examining LLNL procedures and practices for surveillance of safety concerns, it was observed that the documented construction safety program was ineffective. This determination was based on the observation of significant numbers of OSHA-related inconsistencies at nearly every construction site visited. Because of the numbers and types of inconsistencies observed, this situation was determined to represent a Category II concern.

The majority of findings and concerns developed during the portion of the Appraisal related to Compliance with Occupational Safety Standards. The findings and resulting concerns represent those situations which were characteristic of the state of the safety program at the time of the Appraisal. With one exception, all the concerns relate to industrial hazards common to industry. The one exception was in how the OSHA requirements for hoists relate to the glovebox activities in Bldg. 332. Although OSHA requirements in 29 CFR 1910 apply to all industry, including LLNL, the issues associated with operating, inspecting, and maintaining hoists inside plutonium gloveboxes present unique challenges which will have to be addressed.

Even though a number of concerns were documented during the course of this Appraisal, LLNL still has a good overall safety performance record in comparison to both general industry and other DOE laboratories. LLNL has successfully demonstrated that it can maintain an accident, injury, and illness rate below what general industry is able to achieve. Wherever possible, safety deficiencies observed by the Appraisal Team were corrected immediately by LLNL management.

LLNL management recognizes its responsibility to support and maintain an occupational safety program to ensure its employees a safe and healthful workplace.

OS.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Site and facility organization and administration should ensure effective implementation and control of the occupational safety program.

FINDINGS:

- o Facility tours demonstrated a lack of consistency between program divisions/facilities for health and safety program implementation. (See Concern IH.1-2.)

- o LLNL recently retained the services of a consulting engineering firm to conduct similar compliance-type inspections of LLNL facilities. This program has been effective in significantly reducing OSHA compliance items; however, the inspections are limited to facilities and equipment and do not include health and safety programmatic elements (e.g., hoisting and rigging, respiratory protection, record keeping, hazard communication) assessments or Appraisals. The inspections are generally limited to OSHA standards and do not address compliance with other DOE-prescribed standards.

- o In high and moderate hazard facilities, annual facility inspections are conducted by the same LLNL Safety Team members that provide the technical support services on a regular duty assignment basis. Low hazard facilities are similarly inspected but on a much less frequent schedule. There are no other Appraisals/inspections of the facilities by technical health and safety personnel employed by LLNL.

- o See Concerns OA.2-1 and QV.1-1.

CONCERN: (OS.1-1) (H2/C2) LLNL has not implemented an effective independent oversight program for health and safety-related activities.

FINDING:

- o The LLNL OSHA Log 200, the basic source document maintained for recording occupationally related injuries and illnesses, is maintained by the Industrial Safety component of the Hazards Control Division. This document includes requirements for recording injury or illness severity by days of lost or restricted work activity. Entries into the log were incorrectly coded in 0.2 percent of the entries. Consequently, some erroneous data have been forwarded to DOE/DOL. Informal systems for verifying accuracy do exist and errors are usually caught in review of statistical summary reports; however, this does not meet the intent of DOE directives, OSHA standards, or accepted management practices.

CONCERN: (OS.1-2) (H3/C1) LLNL administrative procedures for recording occupationally related illnesses do not ensure that all data reported to DOE/DOL are correct.

OS.2 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Procedures and documentation should provide appropriate direction, record generation, and support for the occupational safety program.

FINDINGS:

- The LLNL Health and Safety Manual, requires operational safety procedures (OSPs) to be prepared for operations involving specified hazards. However, implementation of this requirement has been inconsistent:
  - There were no OSPs for inflating single and multi-piece rimmed wheels as required by 29 CFR 1910.177.
  - There were no OSPs for ensuring wheel component acceptability as required by 29 CFR 1910.177.
  - Asbestos-related maintenance and construction work was being performed without an OSP.
- See Concern OA.5-3.

CONCERN: (OS.2-1) (H2/C1) Some hazardous activities are performed without written Operational Safety Procedures even though these are required by LLNL and/or mandatory requirements.

OS.4 SURVEILLANCE OF SAFETY CONCERNS

PERFORMANCE OBJECTIVE: Appropriate surveillance of activities should be conducted to measure safety performance and ensure the continued effectiveness of controls.

FINDINGS:

- Construction personnel were observed working repeatedly under multiple structural members which were suspended by a crane. Construction personnel were observed working intermittently under suspended loads at two other construction sites.
- Construction escort personnel were observed on two occasions during the Appraisal working inside construction areas without head protection as required by 29 CFR 1926.100.
- Improper storage of flammables was a common noncompliance item at construction sites.
- Fire protection practices at several construction sites were not in conformance with 29 CFR 1926.150 and 29 CFR 1926.151.
- The LLNL construction safety program does not address written hazard communication program requirements in accordance with 29 CFR 1926.59.
- Construction personnel were observed working without the benefit of either ground fault circuit interrupters (GFCIs) or an assured grounding conductor program as required by 29 CFR 1926.404.
- Contractual agreements with construction companies contain clauses requiring contractors to adhere to industry safety regulations. However, there is no documented procedure for penalizing contractors for failure to comply.
- LLNL has only one safety engineer assigned to approximately $140 million in construction projects.

CONCERN: (OS.4-1) (H1/C1) CAT. II — Plant Engineering controls over construction activities are not effective in ensuring that construction work conforms to OSHA requirements in 29 CFR 1926.

OS.5 COMPLIANCE WITH OCCUPATIONAL SAFETY STANDARDS

PERFORMANCE OBJECTIVE: Work places should be free of uncontrolled physical safety concerns and be in compliance with DOE-prescribed occupational safety standards.

FINDINGS:

- o Portable ladders at the site were not maintained in accordance with 29 CFR 1910.25. Deficiencies noted included:
  - Missing or damaged safety feet,
  - Loose hardware and fittings,
  - Splinters, and
  - Decay and severe weathering.
- o Current work practices involving the use of the lock and tag procedures did not conform to the requirements of 29 CFR 1910 or the LLNL Health and Safety Manual. Deficiencies noted included:
  - Failure to adequately secure tags in accordance with 29 CFR 1910,
  - Unreadable "Danger" or "Caution" wording due to fading, and
  - Inappropriate use of both "Caution" and "Danger" tags.
- o Electrical installations and modifications received insufficient review to ensure that they would conform to the National Electrical Code and to 29 CFR 1910. Deficiencies noted included:
  - Standard outlets were frequently used in locations near sinks where GFCIs were required and some GFCIs were found to be nonfunctional.
  - Nonhardened wiring was frequently used in permanent installation of experimental and building equipment.
  - Rigid electrical conduit was frequently used to support cable installations in older buildings such as Bldg. 511. This practice is contrary to the National Electrical Code.
  - Temporary wiring was observed to have been used where permanent wiring was required by the National Electrical Code.
- o Fire extinguishers are not being visually inspected in accordance with OSHA requirements. Deficiencies noted included:
  - A number of fire extinguishers were observed during the Appraisal as not being mounted, not having signage, and/or being blocked.
  - LLNL Safety Team action plans were observed to require visual inspection of fire extinguishers semiannually.

- Fire extinguishers were visually inspected semiannually in some areas rather than monthly as required by 29 CFR 1910.157.

o LLNL controls covering portable power tools and extension cords were not effective in ensuring that power cords and extension cords were in good condition. Deficiencies noted included:

  - Many shop-made cords with multiple outlets were present, both in operating/maintenance areas and at construction sites.

  - A significant number of flexible power cords from tools and equipment, and extension cords were found to be cut or frayed through to the conductors.

o Hoists in Bldg. 332 did not conform to documented requirements for inspection and certification. Deficiencies noted included:

  - Hoisting devices in Bldg. 332 were not receiving documented monthly inspections as required by 29 CFR 1910.179.

  - There was not yet a documented program for inspection and preventive maintenance of powered platforms, and hoisting and rigging devices in Bldg. 332.

CONCERN: (OS.5-1) (H1/C1) The LLNL practices for ladder inspections, electrical installation and modifications, fire extinguisher inspections, portable power tool and cord inspections, and hoist inspections have not been effective in meeting DOE-prescribed occupational safety standards.

Q. FIRE PROTECTION

This Appraisal concentrated on all seven Performance Objectives in the Fire Protection area. Buildings visited at the main site include Bldgs. 111, 113, 114, 115, 116, 117, 131, 191 (HEAF), 194, 221, 222, 223, 224, 227, 231, 233, 251, 281, 292, 321, 313, 323, 324, 331, 332, 334, 412, 419, 436, 490, 492, 511, 513, 514, 520, 612, 614, 620, and several tents and trailers. Buildings visited at Site 300 during this Appraisal included Bldgs. 801, 817, 865, 870, 871, 872, 873, 874, and 875. The Appraisal included interviews with the Fire Protection Engineering Group in Hazards Control Health and Safety Division, Hazards Control Fire Safety Division, Plant Maintenance and Operations Division, and facility managers. A review of the associated DOE and nationally recognized fire protection standards was also conducted during the Appraisal.

The fire protection program at LLNL could be substantially improved. There is no apparent management structure which directly encompasses and is accountable for the entire fire protection area. Several different groups at LLNL are involved with the fire protection concerns, but there is no one group or persons to oversee these groups to assure that all the fire protection and associated life safety concerns are addressed consistently and effectively. Under the present situation, one group can adversely affect the other groups without realizing this is happening.

The Fire Protection Engineering Group in Hazards Control Health and Safety Division is chartered with an oversight function for assuring adequate fire protection is designed and installed. The efforts of this group are directed by the Operational Safety Division LLNL Safety Team Leader. A possible conflict of interest arises in this situation because most of the funding for the group and associated LLNL Safety Teams comes from the organizations for which they provide the oversight.

LLNL Hazards Control Fire Safety Division maintains a three-person, full-time, paid Fire Department at Site 300. The training and equipment for the Site 300 department appear to be in basic compliance with the requirements of the National Fire Protection Association (NFPA). However, the department is considered to be inadequately staffed for emergency response situations involving interior structural fire fighting. This conclusion is based on the DOE interpretation of NFPA-1500, A-6.2.1, which requires five people to be available to fight an interior structural fire. Presently the crew must stage outside the structure, and not enter until backup personnel arrive. An exemption to this rule was requested. It takes approximately 15 to 20 minutes before a full crew is available at Site 300 (main area) and another 10 to 15 minutes for the crew to reach the remote areas of Site 300.

NFPA and Occupational Safety and Health Administration (OSHA) requirements are not being met in several areas at HEAF (Bldg. 191) and Site 300. The primary areas of concern are the unapproved fire alarm system and the associated employee notification system.

Automatic notification of the buildings occupants is required in various areas at these facilities and at present does not occur. In addition, the existing notification system does not meet the requirements of NFPA for voice notification or evacuation systems. Presently the fire alarm system is being upgraded using components that are not listed or approved for fire alarm service by a nationally recognized testing laboratory.

The effect of incorporating nonlisted or unapproved components is unclear, with the exception that it jeopardizes the system's reliability and creates potential interface problems when connecting it with other equipment from different manufacturers. Planning is also underway to update the fire alarm notification/evacuation system, based on the results of a recently completed six-month trial study in three existing facilities.

FP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Fire Protection organization and administration should ensure the effective implementation and control of fire protection equipment and activities.

FINDINGS:

- o The fire protection program is divided among three main groups, who do not interact on a regular basis:
  - The Fire Protection Engineering Group of Hazards Control Health and Safety Division has limited oversight responsibilities, conducts design reviews, issues design guidance, and inspects facilities, as directed by the Operational Safety Division LLNL Safety Team Leaders, for compliance with applicable codes.
  - Hazards Control Fire Safety Division (Fire Department) conducts quarterly inspections of all facilities, issues Hazardous Work Permits, handles all fire protection impairments, conducts the annual fire extinguisher inspection and servicing, and responds to all plant emergency situations other than security.
  - The Plant Maintenance and Operations Division is responsible for the maintenance and testing of the fire alarm systems, water supply systems, sprinkler systems, and voice paging/evacuation systems.
- o There is no review of the fire protection maintenance program records or the procedures used by the Plant Maintenance and Operations Division by the Fire Protection Engineering Group or the Fire Safety Division.
- o No organizational element exists to meld the different organizations involved in the design, testing, and maintenance of fire systems into a cohesive group. Results and findings of the different organizations involved in fire protection are not routed to the other groups on a regular basis, nor is any one group looking at the entire picture to ensure that the requirements are met.
- o To meet the bimonthly alarm testing requirement, the Fire Safety Division does quarterly testing, and the Plant Maintenance and Operations Division does semiannual testing. The two groups do not share the feedback with each other.
- o Deficiencies noted during the Fire Safety Division's inspections have not been recorded and tracked on the Hazards Control Department computer tracking system, "HIRAC."
- o See Section FR.2.

CONCERN: (FP.1-1) (H2/C1) Because the fire protection program is divided among three separate groups, a unified fire protection program does not exist at the main site or Site 300 to meet the requirements of DOE 5480.7 and industry standard practices.

FP.2 LIFE PROTECTION

PERFORMANCE OBJECTIVE: All facilities on site should provide adequate life safety provisions against the effects of fire.

FINDINGS:

- o Life safety features are not completely addressed in the entire LLNL complex:
  - Open stairwells were found in Bldgs. 873 and 874 at Site 300 and in Bldg. 114 at the main site.
  - An air compressor is installed over an open grating leading directly into the exit stairwell in Bldg. 865 at Site 300.
  - Doors leading onto the exit access corridors are not equipped with automatic closures or are blocked open in violation of the Life Safety Code and the Uniform Building Code.
  - The fire alarm notification systems at LLNL do not conform to the Life Safety Code and NFPA-72F.
  - East stairwell of Bldg. 874 at Site 300 has transformer and electrical panels located inside the enclosure in violation of the Life Safety Code.
- o Exemptions to the exit requirement of DOE Explosive Safety Manual have been granted for Bldgs. 809, 827C, 827D, and 827E at Site 300. The reasons for the exemption were based on cost, with no apparent consideration for the Life Safety Code or the LLNL Health and Safety Manual.
- o The DOE Explosive Safety Manual, Life Safety Code, Uniform Building Code, and the LLNL Health and Safety Manual are not in agreement on the exiting and travel distance requirements for explosive handling areas.
- o The Conceptual Design Report for HEAF indicated that the Life Safety Code would be followed for exiting requirements, but the facility was designed according to the less stringent requirements of the DOE Explosive Safety Manual.

CONCERN: (FP.2-1) (H2/C1) The Life Safety Code analysis does not appear to have been followed precisely sitewide, to address the deviations from the existing requirements of the Life Safety Code, DOE Explosive Safety Manual, Uniform Building Code, and the LLNL Health and Safety Manual.

FP.3 PUBLIC PROTECTION

PERFORMANCE OBJECTIVE: All facilities on site should provide adequate protection to prevent any added threat to the public as the result of an onsite fire causing the release of hazardous materials beyond the site (or facility) boundary.

FINDINGS:

- There is no Final Safety Analysis Report (FSAR) for the entire site and no up-to-date FSARs for Bldgs. 251, 331, and 332 covering the possible fire scenarios for many of the buildings or the area.
- The FSAR for HEAF does not address the fire protection or life safety features built into the facility in sufficient detail. It could not be determined from this document which systems are critical and what they are expected to do. There is no indication as to which walls are to be maintained as fire walls, where horizontal exits exist, or what is expected of the smoke removal system.

CONCERN: See Concerns TS.2-2 and OA.7-1.

FP.4 IMPAIRMENT OF OPERATIONS

PERFORMANCE OBJECTIVE: The site should not be vulnerable to being shut down for an unacceptable period as the result of a credible fire.

FINDINGS:

- o Bldg. 1705 houses the central computer for the Air Release Advisory Capability (ARAC) group receiving data and developing programs for releases from 70 U.S. (including Alaska, Hawaii, and Guam) DOE and DOD nuclear installations. It is also used to provide data in the event a commercial nuclear plant has a problem. This is the only facility of its kind in the United States.

- o Bldg. 1705 has automatic sprinklers and smoke detectors. It has no gaseous fire suppression system in the cable runs below the computer floor.

- o Bldg. 1705 is exposed to fire damage by several unsprinklered combustible trailers on three sides approximately 30 feet distant.

CONCERN: (FP.4-1) (H1/C2) The loss by fire in the cable run areas or from severe exposure from Trailers 1701, 1702, or 1703 could result in the shutdown of a facility (Bldg. 1705).

FP.5 PROPERTY PROTECTION

PERFORMANCE OBJECTIVE: A maximum credible fire, as defined in DOE 5480.7, Section 6f, should not result in an unacceptable property loss.

FINDINGS:

- The Factory Mutual Research Corporation in its fire protection survey report dated July 1987 made 29 recommendations for supervision of valves, electric supply reliability, water supply reliability at Site 300, automatic sprinkler protection, and fixed automatic gaseous suppression for loss potential over $1 million. Many have been completed. Others have been outdated by either replacement of facilities or elimination of hazard. Many have not been completed, primarily those involving isolation of highly valued computers (valued from $5 to $27 million) by 1-hour fire walls and installation of fixed automatic gaseous fire suppression systems, valve supervision and alarms.

- Cold weather valves controlling automatic sprinkler system water supplies to exterior portions of Bldgs. 871, 873, and 874 were found closed at Site 300. These valves are closed each fall and reopened in the spring. No special precautions are taken during the winter period when the valves are in the closed position (loss potential less than $1 million).

- The majority of the sprinklered buildings at Site 300 have portions of the automatic sprinkler systems which appear to be subject to freezing.

- Heat tape and/or heaters were noted on the automatic sprinkler system riser for the majority of the Site 300 buildings. This form of heating is not monitored for faults and does not protect all areas which are subject to freezing.

- Although many of the newer buildings meet Factory Mutual requirements, the large number of buildings with basic deficiencies in protection results in the site, as a whole, not meeting Factory Mutual requirements.

CONCERN: (FP.5-1) (H2/C2) The recommendations contained in the Factory Mutual Research Corporation (FMRC) report are not being implemented in a timely manner. DOE has not granted exemptions from the FMRC report.

CONCERN: (FP.5-2) (H2/C2) The automatic sprinkler systems at Site 300 are not fully operational, and others cannot be considered reliable during subfreezing weather.

FP.6 FIRE DEPARTMENT OPERATIONS

PERFORMANCE OBJECTIVE: The Fire Department should have the capacity to promptly terminate and mitigate the effects of a fire in a safe and effective manner.

FINDING:

- o LLNL Hazards Control Fire Safety Division maintains a three-person, full-time, paid Fire Department at Site 300. The training and equipment for the Site 300 Department appear to be in basic compliance with the requirements of the National Fire Protection Association (NFPA). However, the department is considered to be inadequately staffed for emergency response situations involving interior structural fire fighting. This conclusion is based on the DOE interpretation of NFPA-1500, A-6.2.1, which requires five people to be available to fight an interior structural fire. Presently the crew must stage outside the structure, and not enter until backup personnel arrive. An exemption to this rule was requested. It takes approximately 15 to 20 minutes before a full crew is available at Site 300 (main area) and another 10 to 15 minutes for the crew to reach the remote areas of Site 300.

CONCERN: (FP.6-1) (H2/C1) Because the Site 300 Fire Department is not fully staffed, potential interior fire fighting activities are limited.

FP.7 PROGRAM IMPLEMENTATION

PERFORMANCE OBJECTIVE: A fire protection engineering program should be in place to effectively provide and maintain an "improved risk" level of fire protection.

FINDINGS:

- The work request Whiz Tag System used at LLNL to allow for modification and installation of equipment and building modifications does not involve review by the Fire Protection Engineering Group. Approximately 35,000 Whiz Tag System work requests were issued in 1989.
- The Fire Protection Engineering Group reviews and comments on proposed designs, but does not have the authority to enforce comments made. Plans have been signed off by Hazards Control without all fire safety issues being resolved.
- The Fire Protection Engineering Group is not involved in the acceptance of new installations other than by specific request.
- A new fire alarm system is being designed and installed at LLNL, which is not currently Underwriters Laboratories (UL) listed or Factory Mutual approved as required by DOE 5480.4, DOE 6430.1A, or the National Fire Codes.
- HEAF was designed, constructed, and accepted without the Life Safety Code-required automatic evacuation system and the exterior water flow alarm required by NFPA-13.
- The allowable quantities and use of flammable liquids in the laboratory areas of HEAF are not clearly identified to assure compliance with NFPA-45 (Standard on Fire Protection for Laboratories Using Chemicals) and NFPA-30 (Flammable and Combustible Liquids Code).
- The hydraulically designed automatic sprinkler systems in HEAF and the Advanced Test Accelerator (ATA) did not use the hose stream requirements outlined in DOE 6430.1.
- See Sections FR.2 and MA.4, and Concerns MA.2-1 and QV.1-1.

CONCERN: (FP.7-1) (H2/C1) Design review and planning are incomplete for new construction and building modifications involving fire protection and life safety.

FINDINGS:

- Pressure gauges for the automatic sprinkler risers were found missing on the following buildings: Bldgs. 817A, 871, 873, 874, 875, and 876.
- Smoke detectors are not tested for sensitivity as required by the Occupational Safety and Health Act (OSHA) in 29 CFR 1910.164c4.

- o Batteries for control panels with battery backup are not load tested in accordance with the NFPA requirements or industry standard good practices.

- o The two automatic balanced pressure foam systems located at the ATA are no longer serviced by the installing company. The status of these systems was unclear to plant personnel at the time of the Appraisal.

- o Water flow alarm testing is not conducted in accordance with Factory Mutual recommended practices. Current practice meets the minimum requirements of NFPA but is not in conformance with the Improved Risk Criteria of Factory Mutual.

- o The valves controlling fire protection water supplies are not inspected in accordance with the Factory Mutual recommended practices.

- o See Section TS.4.

CONCERN: (FP.7-2) (H2/C1) The preventive maintenance, inspection, and testing of fire systems and fire alarm systems is not in compliance with DOE 5480.7 and DOE 6430.1A.

FINDINGS:

- o Water flow testing in the ATA area indicated the water supplies available are inadequate to meet the hydraulic design requirements per NFPA-13 for the automatic sprinkler systems as installed. The deficiencies in the water supply to this area were noted by Factory Mutual in 1987. A new pump and associated suction tank were recommended at that time.

- o The oil systems at the ATA are being drained and additional sprinkler protection has been installed, thus reducing the potential of a serious fire. However, numerous other recommendations were listed in a Fire Protection Survey conducted by Factory Mutual Engineering in 1987 to help limit the loss potential; these recommendations have not been completely implemented. SAN is requesting temporary exemption to the Factory Mutual recommendations based on the nonoperational status of the facility. To date these exemptions have not been granted.

CONCERN: (FP.7-3) (H1/C1) The deficiencies noted by Factory Mutual for Site 300 have not been addressed in a timely manner.

FINDINGS:

- o At the main site and Site 300, automatic sprinkler valves are not checked monthly in accordance with the DOE-required Factory Mutual recommended practices. These valves are locked open, have partial electronic supervision, and valve closures are controlled by the Fire Department impairment program.

- o Valves located on the underground distribution system supplying fire protection water are not checked monthly, do not have electronic supervision, are not locked open, and are not controlled by the Fire Department impairment program.

- o The main control valve for the automatic sprinkler system protecting the office area of HEAF is located inside the fire area without provisions for exterior access.

- o See Section AX-6.

CONCERN: (FP.7-4) (H1/C1) The fire protection water supplies are considered insufficient per NFPA-13 and Factory Mutual Research Corporation (FMRC) Data Sheet 2-8N and unreliable at Site 300 due to deficiencies in the flow and pressure available, and in the valve inspection program. Deficiencies in the valve inspection program and the limited accessibility to the fire protection control valves make the water supplies at LLNL unreliable.

FINDING:

- o The sitewide fire alarm system is not UL listed or Factory Mutual approved. The system uses unlisted components and does not provide automatic notification to the building occupants of HEAF:

  - The fire alarms system has not been designed and installed in compliance with NFPA-72D (Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems).

  - The sitewide fire alarm system is based on a design developed by LLNL.

CONCERN: (FP.7-5) (H2/C1) CAT. II The sitewide fire alarm system is deficient in meeting requirements (NFPA-72D) for the use of listed or approved fire alarm equipment and does not provide for automatic notification to building occupants.

R. MEDICAL SERVICES

This Appraisal addressed all five Performance Objectives in the Medical Services area. The program conducted by the LLNL Health Services Department contains all of the elements required of a full service, comprehensive, contemporary occupational medical facility. The program is broad in scope and of high quality. The staff is well qualified and trained. Management communicates and interacts effectively with other health and safety professionals, DOE, and community resources. Current demands for service are being met.

The medical facility is spacious, modern, and well equipped. It was designed with special emphasis on emergency response capability. Multiple casualties could be held and managed for 72 hours in the event of failure or saturation of community resources as might occur in a severe earthquake or other serious event. A satellite medical unit, located at Site 300, is staffed by a trained and experienced Mobile Intensive Care Nurse (MICN).

The Medical Director has MD and MPH degrees and is certified as a specialist in Occupational Medicine by the American Board of Preventive Medicine. The staff consists of 4 MDs, a psychologist Ph.D., 10 registered nurses, 3 nurse practitioners, and support personnel. Retraining and continuing education are encouraged, promoted, and provided in house and offsite. Training is well documented. The Medical Director reports to an Associate Director and participates in his regular staff meetings.

Clinical programs provide medical care for emergencies and temporary care and counseling for personal illness. Work injuries are treated on site or referred to competent specialists as appropriate. A broad range of comprehensive physical examinations are performed. Results are discussed. If risk factors or health problems exist, remedial action is advised. Accurate and complete records are made and are carefully maintained. An Employee Assistance Program (EAP) of broad scope is available to employees and their dependents. Many activities and programs are conducted in health education, illness and injury prevention, and health promotion. Medical Services plays a significant role in the substance abuse program. The policy regarding substance abuse is well documented and communicated. Emergency capability, response, and planning are excellent and well documented. Drills are conducted at least annually using diverse scenarios.

Procedures, practices, and programs are well documented and communicated. Timely reviews and revisions occur. A library is maintained with relevant reference material such as journals, books, orders, and manuals of policies, practices, and procedures. Copies of a recently written Operating Procedures Manual are distributed throughout the facility. This is a problem-oriented document, well organized and indexed; it provides instructions for response to most events that could be anticipated.

In recent (September 1989 and February 1990) reviews (audits) of the medical program arranged by the Medical Director, DOE judged the program to be excellent. Recommendations were made to enhance the EAP and Wellness programs, to computerize medical and exposure data, and to augment and restructure the staff. Additional FTEs will relieve some of the staff from routine demands and permit them to use their talents for program development and management and to plan for future needs.

Several Noteworthy Practices were observed, including the "Mole Patrol" (Melanoma Clinic), the Operating Practices Manual, and Biohazard Surveillance Program.

IV. NOTEWORTHY PRACTICES

Noteworthy Practices are exceptional ways of accomplishing a Performance Objective or some aspect of it. Other DOE facilities are encouraged to adopt these practices when applicable to their operations.

EP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Emergency preparedness organization and administration should ensure effective planning for, and implementation and control of, site/facility emergency response.

NOTEWORTHY PRACTICE: LLNL Emergency Preparedness has encouraged LLNL employees to volunteer to participate in first aid, medical support teams and in two SELF HELP Programs. These volunteers are providing a real humanitarian service to the LLNL employees by devoting considerable time and effort in training, retraining and participating in site drills, facility drills and annual exercises. The SELF HELP Emergency Plan provides facility employees with the necessary information and instructions to react to all phases of emergency response emergencies. New employees are provided with facility safety practices.

EP.5 EMERGENCY FACILITIES, EQUIPMENT, AND RESOURCES

PERFORMANCE OBJECTIVE: Emergency facilities, equipment, and resources should adequately support site/facility emergency operations.

NOTEWORTHY PRACTICE: The LLNL Fire Department has an excellent, well-designed mobile incident response command vehicle which has all the capabilities equipment and resources to include documents that address and support an on screen command post operation. This vehicle has a SCBA cylinder re-filing capability on both sides of the vehicle, carries protective clothing and equipment, first-aid materials and special designed casks to remove toxic chemical leaking containers.

NOTEWORTHY PRACTICE: Each facility and zone has their own individual emergency lockers position outside each facility. These lockers contain sufficient materials, resources and equipment to support any LLNL credible emergency situation.

CS.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: All operations with fissionable material should be conducted to provide effective nuclear criticality control during all activities.

NOTEWORTHY PRACTICE: The Criticality and Safety Analysis Group has developed and implemented a manual to assure consistency and quality in criticality safety audits. It is titled Criticality Safety Audits-LLNL Team Manual, and includes an appendix volume containing reference documents.

This manual provides the audit team with the applicable DOE Orders and ANSI/ANS standards and gives guidance for a thorough criticality audit which follows a four step process:

1. Before the audit,
2. During the audit,
3. After the audit, and
4. Tracking status of recommendations.

Each step consists of several tasks which are provided in detailed descriptions.

IH.3 MANAGEMENT OF HEALTH CONCERNS

PERFORMANCE OBJECTIVE: Chemical, biological, physical, and/or other environmental stresses arising in the workplace should be identified, evaluated, and controlled.

NOTEWORTHY PRACTICES: LLNL has the "R-Program Safety and Health Plan" which is a comprehensive state-of-the-art workplace surveillance program including both technical and medical aspects. The potential for a significant exposure to a toxic metallic containing compounds without prescribed exposure limits was the basis for instituting the Health and Safety Plan. Engineering and administrative controls were incorporated into the Plan to assure maximum protection for employees at the ALARA level. Personal exposure samples are collected along with area samples in an effort to develop a thorough understanding of the potential workplace exposure conditions. Along with the personal samples, bioassay samples are collected on a scheduled basis. The results are incorporated into an on-line data management system which is tied to the program management in three buildings, industrial hygienists in Hazards Control, and physicians in Occupational Medicine. The individual staff disciplines evaluate the data and develop plans to assess the significance of the reported exposure data. Corrective actions including changes to the Plan are made to enhance the level of protection for assigned personnel.

OS.3 MANAGEMENT OF SAFETY CONCERNS

PERFORMANCE OBJECTIVE: Physical and/or other environmental stresses arising in the workplace should be identified, evaluated, and controlled.

NOTEWORTHY PRACTICE: The portion of the Preplacement Testing Pilot Program dealing with the use of photographs and video tapes is considered a Noteworthy Practice. LLNL has initiated a Preplacement Testing Pilot Program targeted toward jobs which have been identified as clearly having a high incidence in overexertion injuries. In addition to the program components of a job analysis, incorporation of ergonomic controls, and preplacement testing, the program utilizes photographs and videotapes to help keep Medical informed on the duties associated with an individual job. In this way, the medical staff can gain insights into jobs which they do not have the time or resources to obtain directly. The Human Resources Department also plans to use the photographs and videotapes in the recruiting and hiring process. Applicants will have an opportunity to see the work environment and what the job entails before deciding whether to accept the job.

MS.2 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Procedures and documentation should provide appropriate direction, record generation, and support of the medical services for the facility and site.

NOTEWORTHY PRACTICE: LLNL Health Services Department has developed a high quality Operating Procedures Manual which is placed at various locations throughout LLNL. The document is problem-oriented, well organized and indexed, and provides complete instructions for response to most occurrences that could be anticipated. An outstanding reference, it serves also as a training tool.

MS.3 MEDICAL TREATMENT

PERFORMANCE OBJECTIVE: Medical treatment should be available and provided by qualified, competent staff, and adequate facilities should be available.

NOTEWORTHY PRACTICE: LLNL Health Services Department conducts a Melanoma Clinic "Mole Patrol," staffed by a dermatologist. Employees are encouraged by an active outreach program to come in for evaluation and advice regarding suspicious moles. Early diagnosis and treatment is the goal. Statistical studies are planned.

NOTEWORTHY PRACTICE: LLNL Health Services Department conducts a Biohazard Medical Surveillance Program. In addition to periodic examinations, appropriate immunizations are provided to employees potentially exposed to body fluids, and a preplacement serum specimen is obtained and stored (frozen) for future reference if needed.

APPENDIX A

System for Categorizing Concerns

Each concern contained in this report has been characterized using the following three sets of criteria.

A. CATEGORY I: Addresses a situation for which a "clear and present" danger exists to workers or members of the public. A concern in this category is to be immediately conveyed to the managers of the facility for action. If a clear and present danger exists, the Assistant Secretary for Environment, Safety, and Health, or his/her designee, is to be informed immediately so that consideration may be given to exercising the Secretary's facility shutdown authority or directing other immediate mitigation measures.

CATEGORY II: Addresses a significant risk or substantial noncompliance with DOE Orders but does not involve a situation for which a clear and present danger exists to workers or members of the public. A concern in this category is to be conveyed to the manager of the facility no later than the appraisal closeout meeting for immediate attention. Category II concerns have a significance and urgency such that the necessary field response should not be delayed until the preparation of a final report or the routine development of an action plan. Again, consideration should be given to whether compensatory measures, mitigation, or facility shutdown are warranted under the circumstances.

CATEGORY III: Addresses significant noncompliance with DOE Orders, or the need for improvement in the margin of safety, but is not of sufficient urgency to require immediate attention.

B. Hazard Level 1: Has the potential for causing a severe occupational injury, illness, or fatality, or the loss of the facility.

Hazard Level 2: Has the potential for causing minor occupational injury or illness or major property damage, or has the potential for resulting in, or contributing to, unnecessary exposure to radiation or toxic substances.

Hazard Level 3: Has little potential for threatening safety, health, or property.

C. Compliance Level 1: Does not comply with DOE Orders, prescribed policies or standards, or documented accepted practices. The latter is a professional judgment based on the acceptance and applicability of national consensus standards not prescribed by DOE requirements.

Compliance Level 2: Does not comply with DOE references, standards, or guidance, or with good practice (as derived from industry experience, but not based on national consensus standards).

Compliance Level 3: Has little or no compliance considerations. These concerns are based on professional judgment in pursuit of excellence in design or practice, i.e., these are improvements for their own sake and are not deficiency driven.

APPENDIX B

Categorization and Tabulation of Concerns

Using the criteria in Appendix A, the majority of the Concerns have been categorized as Category III for seriousness. Five Concerns have been identified as Category II issues requiring prompt management attention. The Concerns have also been characterized by potential risk and compliance considerations. Attchment B-1 of this Appendix summarizes the results of the characterizations.

All of the Concerns are tabulated in Attachment B-2 of this Appendix without their supporting bases. The user is cautioned that to fully understand any Concern, it is necessary to read its basis in Section II.

APPENDIX B-1

Categorization and Tabulation of Concerns

CONCERN NUMBER	POTENTIAL HAZARD LEVEL	COMPLIANCE LEVEL
OA.1-1	3	2
OA.1-2	2	2
OA.1-3	2	2
OA.1-4	3	2
OA.1-5	1	2
OA.1-6	2	1
OA.1-7	1	1
OA.2-1	2	2
OA.3-1	2	2
OA.4-1	3	2
OA.5-1	2	1
OA.5-2	2	1
OA.5-3	2	2
OA.5-4	2	2
OA.5-5	2	2
OA.6-1	3	2
OA.6-2	3	2
OA.7-1	2	1
OA.7-2	2	2
OA.8-1	2	2
QV.1-1	2	1
QV.1-2	2	1
QV.4-1	2	1
OP.1-1	2	2
OP.1-2	2	1
OP.1-3	3	2
OP.2-1	2	2
OP.3-1	2	2
OP.3-2	1	2
OP.3-3	1	2
OP.3-4	1	2
OP.3-5	2	2
OP.4-1	2	1
OP.5-1	2	2
OP.5-2	2	2
OP.6-1	2	2
OP.8-1	2	2
OP.8-2	2	1
MA.1-1	3	2
MA.1-2	3	2
MA.1-3	2	2
MA.1-4	2	2
MA.1-5	2	2

*Designates a Category II Concern

APPENDIX B-1 (Cont'd)

CONCERNS NUMBER	POTENTIAL HAZARD LEVEL	COMPLIANCE LEVEL
MA.2-1*	1	2
MA.2-2	3	2
MA.2-3	3	2
MA.2-4	2	2
MA.3-1	2	2
MA.3-2	3	2
MA.4-1	3	2
MA.5-1	2	2
MA.5-2	2	2
MA.6-1	3	2
MA.7-1	3	2
MA.8-1	2	2
TC.1-1	2	2
TC.4-1	2	2
AX.1-1	2	2
AX.3-1	2	2
AX.6-1	2	2
EP.1-1	2	1
EP.2-1	2	1
EP.2-2	2	1
EP.3-1	2	1
EP.3-2	2	1
EP.3-3	2	1
EP.4-1	2	1
EP.5-1	2	2
EP.6-1	2	1
EP.7-1	2	2
TS.2-1	2	2
TS.2-2	2	1
TS.2-3	2	1
TS.2-4	2	1
TS.3-1	2	2
TS.3-2	2	2
TS.5-1	2	2
PT.1-1	1	1
PT.3-1	2	1
PT.3-2	2	1
PT.3-3	2	1
PT.4-1	2	1
PT.6-1*	2	1
PT.6-2*	2	1

*Designates a Category II Concern

APPENDIX B-1 (Cont'd)

CONCERNS NUMBER	POTENTIAL HAZARD LEVEL	COMPLIANCE LEVEL
CS.3-1	3	2
CS.5-1	2	2
SS.1-1	2	2
SS.3-1	2	2
SS.3-2	2	1
SS.4-1	2	1
SS.4-2	3	1
SS.4-3	2	1
SS.4-4	2	2
FR.1-1	2	1
FR.3-1	2	2
FR.4-1	3	1
FR.4-2	2	1
FR.5-1	2	1
FR.6-1	2	2
RP.1-1	2	1
RP.1-2	2	2
RP.2-1	2	1
RP.2-2	3	2
RP.3-1	2	2
RP.3-2	1	1
RP.6-1	2	2
RP.6-2	2	1
RP.7-1	2	1
RP.7-2	2	2
RP.8-1	2	2
RP.9-1	1	1
RP.10-1	2	2
RP.10-2	2	1
RP.11-1	2	2
RP.12-1	3	2
IH.1-1	2	2
IH.1-2	2	2
IH.1-3	2	1
IH.1-4	2	2
IH.2-1	2	1
IH.3-1	2	1
IH.3-2	2	2
IH.4-1	2	2
IH.5-1	2	2
IH.5-2	2	2
IH.6-1	2	2

*Designates a Category II Concern

APPENDIX B-1 (Cont'd)

CONCERNS NUMBER	POTENTIAL HAZARD LEVEL	COMPLIANCE LEVEL
OS.1-1	2	2
OS.1-2	3	1
OS.2-1	2	1
OS.4-1*	1	1
OS.5-1	1	1
FP.1-1	2	1
FP.2-1	2	1
FP.4-1	1	2
FP.5-1	2	2
FP.5-2	2	2
FP.6-1	2	1
FP.7-1	2	1
FP.7-2	2	1
FP.7-3	1	1
FP.7-4	1	1
FP.7-5*	2	1

*Designates a Category II Concern

APPENDIX B-2

Tabulation of Concerns

A. Organization and Administration

CONCERN: (OA.1-1) (H3/C2) Accountability for safety responsibility is not clearly defined because of the lack of upper-level management control documentation.

CONCERN: (OA.1-2) (H2/C2) LLNL has failed to maintain clear lines of safety responsibility and independence of safety overview.

CONCERN: (OA.1-3) (H2/C2) All management personnel and staff interviewed at Site 300 do not have the same understanding of the line of their safety responsibilities.

CONCERN: (OA.1-4) (H3/C2) Mission/function statements that define the assigned organizational purpose and how this purpose is to be accomplished do not exist for all organizational units.

CONCERN: (OA.1-5) (H1/C2) The Resident Manager does not have sufficient direct authority or resources to fulfill his safety responsibilities.

CONCERN: (OA.1-6) (H2/C1) For Site 300, it is frequently not possible, as required by DOE 5480.1B and DOE 5482.1B, to trace a single line of safety responsibility from the LLNL Director to the staff performing the task.

CONCERN: (OA.1-7) (H1/C1) There is no LLNL system in place to ensure that DOE policies and requirements are addressed by the cognizant personnel and that compliance with the requirements is currently maintained. As a result, LLNL operations are being conducted in significant noncompliance with DOE Orders.

CONCERN: (OA.2-1) (H2/C2) Conflicts of interest between responsibilities for program and safety exist at LLNL.

CONCERN: (OA.3-1) (H2/C2) LLNL does not require and does not have written and promulgated sitewide safety goals, nor do all departmental elements have specific, measurable safety goals which can be tracked.

CONCERN: (OA.4-1) (H3/C2) The University of California demonstrates little corporate commitment to safe operations at LLNL.

CONCERN: (OA.5-1) (H2/C1) The performance of corrective actions and the prevention of recurrence through addressing basic causes and related generic problems does not meet the Corrective Action requirements of DOE 5700.6B.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (OA.5-2) (H2/C1) The UOR program at LLNL does not conform to the policy and objectives of the Unusual Occurrence Reporting System, DOE 5000.3, Sections 7.a.(5) and 7.b.(2) and (3).

CONCERN: (OA.5-3) (H2/C2) Complete and accurate information necessary for safe operation is not systematically and consistently being developed and promulgated to employees.

CONCERN: (OA.5-4) (H2/C2) The audit program does not provide needed management information on the conduct of activities undertaken to comply with procedural requirements as required by DOE 5700.6B.

CONCERN: (OA.5-5) (H2/C2) A sitewide system for analysis and trending of operational data and consequent corrective action has not been developed and implemented by LLNL.

CONCERN: (OA.6-1) (H3/C2) Means to ensure that job descriptions and qualifications reflect LLNL needs, and that personnel performance is measured in a consistent way, have not been established at LLNL.

CONCERN: (OA.6-2) (H3/C2) Specific position/job descriptions, which delineate specific safety responsibilities, do not exist for all management personnel.

CONCERN: (OA.7-1) (H2/C1) LLNL is not in compliance with DOE 5481.1B and SAN MD 5481.1A for the preparation of safety analysis documents for all facilities.

CONCERN: (OA.7-2) (H2/C2) Current key safety documents are not available and controlled in accordance with recommended standards such as ANSI/ASME NQA-1 as indicated in DOE 5700.6B.

CONCERN: (OA.8-1) (H2/C2) The LLNL fitness-for-duty program is deficient with respect to its application to prospective employees, employees in sensitive positions, visitors, and subcontractor employees.

B. Quality Verification

CONCERN: (QV.1-1) (H2/C1) The LLNL quality assurance program does not meet the requirements of DOE 5700.6B for independent verification of activities that affect quality and for the selective application of the quality assurance elements in the recognized standard ANSI/ASME NQA-1.

CONCERN: (QV.1-2) (H2/C1) Quality assurance (QA) requirements are not being implemented to meet DOE 5700.6B and the LLNL Quality Assurance Manual requirements for QA elements such as auditing, staff training, and developing and implementing quality practices.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (QV.4-1) (H2/C1) There is no sitewide LLNL calibration policy for measuring and test equipment as required by DOE 5700.6B and ANSI/ASME NQA-1.

C. Operations

CONCERN: (OP.1-1) (H2/C2) LLNL main site management does not maintain a continuous, in-depth involvement in Site 300 operations and safety issues.

CONCERN: (OP.1-2) (H2/C1) Formal administrative controls for operations are not consistent in the way they are provided, applied, enforced, and monitored throughout LLNL; nor do they conform completely to the format specified in SAN MD 5481.1A.

CONCERN: (OP.1-3) (H3/C2) There is no sitewide requirement to address safety performance as part of the annual performance appraisal within the operating divisions at LLNL.

CONCERN: (OP.2-1) (H2/C2) No document includes procedures and guidelines covering the maintenance of skills of operators assigned to the various Site 300 facilities.

CONCERN: (OP.3-1) (H2/C2) Documentation does not demonstrate that the policies and procedures governing operations at Site 300 and the High Explosives Applications Facility (HEAF, Bldg. 191) facilities are strictly adhered to.

CONCERN: (OP.3-2) (H1/C2) Existing procedures and equipment do not effectively guide or support the Site 300 operations staff when unusual or abnormal situations are encountered.

CONCERN: (OP.3-3) (H1/C2) Not all policies defining activities that require Facility Safety or Operational Safety Procedures may be sufficiently specific to cover all hazardous operations at Site 300.

CONCERN: (OP.3-4) (H1/C2) The safe conduct of routinely performed, normal operations at Site 300 is not always ensured or guided by formal mechanisms such as written checklists.

CONCERN: (OP.3-5) (H2/C2) The LLNL program to improve the criteria for mandating the use of approved procedures in Bldg. 331 is not yet implemented.

CONCERN: (OP.4-1) (H2/C1) Health and Safety Manual Supplement 26.13, General Lock and Tag Procedure, revised June 27, 1984, does not comply with the provisions of 29 CFR 1910.147 for use of locks and tags.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (OP.5-1) (H2/C2) Not all explosives operations strictly comply with the provisions of DOE/EV/06194, DOE Explosive Safety Manual, with respect to items such as electrical line routing, personnel access controls, and ignition sources.

CONCERN: (OP.5-2) (H2/C2) One storage cubicle in Bldg. 229 did not have a barrier to suppress missiles from escaping the magazine, as recommended by a Department of Defense Explosives Safety Inspection Team in 1985.

CONCERN: (OP.6-1) (H2/C2) Safety-related information (unusual occurrence reports, lessons learned, and documented safety meetings) does not reach the operating staffs in a consistent or effective manner at LLNL.

CONCERN: (OP.8-1) (H2/C2) A policy governing the approval and posting of operating aids in control rooms does not exist.

CONCERN: (OP.8-2) (H2/C1) LLNL has no requirement for the inclusion of human factors engineering in the design, layout, and operations of facilities, as required by DOE 6430.1A, Section 1300-12 for nonreactor nuclear facilities.

D. Maintenance

CONCERN: (MA.1-1) (H3/C2) Organizational documentation needed for an effective maintenance program is not complete since not all equipment is covered and maintenance is not systematically controlled in accordance with technical manuals.

CONCERN: (MA.1-2) (H3/C2) Conformance to DOE 4330.4 is not fully in effect and is not currently a contractual requirement.

CONCERN: (MA.1-3) (H2/C2) The heavy reliance on the skills of personnel to ensure proper maintenance and the assurance of continuity of talents is not sufficiently balanced by formally documented procedures.

CONCERN: (MA.1-4) (H2/C2) The plant and utilities, particularly the older portions, have deteriorated to the extent that a major recovery effort is necessary.

CONCERN: (MA.1-5) (H2/C2) No policy is in place to ensure that basic maintenance requirements are given the required emphasis and priority with respect to programmatic activities.

CONCERN: (MA.2-1) (H1/C2) CAT. II In general, the Whiz Tag System does not contain guidance, criteria, and controls to ensure safe conduct of maintenance of plant systems and facilities nor control of safety system design features.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (MA.2-2) (H3/C2) Maintenance procedures do not provide detailed guidance for maintenance activities.

CONCERN: (MA.2-3) (H3/C2) In some areas, building-specific responsibility for identifying and correcting preservation and maintenance problems is not clearly assigned and does not effectively support building systems such as water, gas, and electric utilities.

CONCERN: (MA.2-4) (H2/C2) A policy establishing basic guidelines for maintenance and calibration of key programmatic equipmen' and instrumentation is lacking.

CONCERN: (MA.3-1) (H2/C2) The LLNL main maintenance shop, Bldg. 511, is in a poor state of repair.

CONCERN: (MA.3-2) (H3/C2) There is no mechanism to ensure that all machine tools are included in the centralized machine tool maintenance program.

CONCERN: (MA.4-1) (H3/C2) Informal maintenance procedures impact maintenance planning and work control.

CONCERN: (MA.5-1) (H2/C2) A high level of corrective maintenance to buildings and utilities is not evident at LLNL.

CONCERN: (MA.5-2) (H2/C2) Older experimental systems do not receive the required level of corrective maintenance to ensure safe and efficient operations.

CONCERN: (MA.6-1) (H3/C2) Preventive maintenance activities have not been optimized with vendor recommendations or with locally generated, component-specific procedures or checklists.

CONCERN: (MA.7-1) (H3/C2) A predictive maintenance program is not fully in place, and overall planning, scheduling, and budgeting have not been completed in sufficient detail to evaluate the planned program and its associated goals.

CONCERN: (MA.8-1) (H2/C2) At essentially all program areas examined, formal maintenance procedures for programmatic equipment are not employed.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

E. Training and Certification

CONCERN: (TC.1-1) (H2/C2) Training at LLNL is not supported by corporate policy and standards and is not formally established consistent with good practice and DOE expectations.

CONCERN: (TC.4-1) (H2/C2) LLNL has not maintained radiological protection retraining requirements as specified in DOE 5480.11 or in accordance with good industry practice.

F. Auxiliary Systems

CONCERN: (AX.1-1) (H2/C2) Auxiliary systems at the explosive testing facilities are poorly designed and maintained.

CONCERN: (AX.3-1) (H2/C2) The Administrative Memo, "Director's Statement on Waste Minimization," issued March 8, 1989, has not been aggressively enforced.

CONCERN: (AX.6-1) (H2/C2) The availability testing of emergency generators does not verify operability of the system because there is no assurance that diesel fuel quality has not degraded, and a checklist is not completed by the test conductors as the test proceeds.

G. Emergency Preparedness

CONCERN: (EP.1-1) (H2/C1) The LLNL Emergency Plan is not in compliance with DOE 5500.3 or draft DOE 5500.3A, Chapter III, Sections 1b and c.

CONCERN: (EP.2-1) (H2/C1) The LLNL Emergency Plan is not in accordance with DOE 5500.3 or draft DOE 5500.3A, Chapter III, Planning and Preparedness (i.e., Hazards Identification, Updating Hazards, Analysis Requirements, Accident or Event Characteristics).

CONCERN: (EP.2-2) (H2/C1) LLNL Emergency Plan Implementing Procedures are not in accordance with the requirements of DOE 5500.3 or draft DOE 5500.3A which address the facility emergency operations.

CONCERN: (EP.3-1) (H2/C1) Emergency Response Training Programs have not been developed for all LLNL Facility Managers and Technical Coordinators and do not ensure adequate documentation of the program in accordance with DOE 5500.3 or draft DOE 5500.3A, Chapter III., Section 1.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (EP.3-2) (H2/C1) LLNL Emergency Response Training is not in compliance with DOE 5500.3, draft DOE 5500.3A, and the DOE Training Accreditation Program (TAP).

CONCERN: (EP.3-3) (H2/C1) The Emergency Public Information Program is not in accordance with DOE 5500.3 or draft DOE 5500.3A, Chapter III., Public Information, in that timely release of public information was not made to simulated offsite agencies.

CONCERN: (EP.4-1) (H2/C1) The LLNL Emergency Preparedness drill and exercise program does not comply with requirements of DOE 5500.3, that all facility drills are not documented.

CONCERN: (EP.5-1) (H2/C2) The equipment, materials, resources, and documentation requirements of draft DOE 5500.3A are not used to ensure that all required items are available for emergencies in the LLNL Emergency Operations Center.

CONCERN: (EP.6-1) (H2/C1) LLNL does not have the necessary coordination meetings by the State and local emergency management agencies to obtain approval of the LLNL Emergency Plan, Emergency Action Levels and Emergency Classification Systems, as required in DOE 5500.3.

CONCERN: (EP.7-1) (H2/C2) The LLNL Emergency Plan does not meet the requirements of draft DOE 5500.3A, Chapter II, Hazards Assessment, in providing a detailed listing of hazards and accidents analyzed in the Safety Analysis Report.

H. Technical Support

CONCERN: (TS.2-1) (H2/C2) The review system for LLNL safety procedures does not ensure auditability of reviews or performance of independent technical peer reviews within the originating organization.

CONCERN: (TS.2-2) (H2/C1) LLNL has not made a determination whether existing safety analysis documentation adequately identifies the risks associated with all of its operating facilities that can be reasonably expected to have potential for major onsite or offsite impacts to people or the environment, as required by DOE 5481.1B, Chapter II, Section 4.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (TS.2-3) (H2/C1) Not all LLNL facilities that require Safety Analysis Reports have them in place, and existing Safety Analysis Reports and Safety Analysis Documents do not adequately define Operational Safety Requirements, designate equipment important to safety, or reflect complete safety analyses as required by DOE 5480.5, DOE 5481.1B, and LLNL Safety Analysis Report guidance.

CONCERN: (TS.2-4) (H2/C1) Not all LLNL facilities have Operational Safety Requirements (OSRs) in compliance with DOE 5480.5 requirements and SAN MD 5481.1A guidance. Those OSRs that do exist are deficient in content and format.

CONCERN: (TS.3-1) (H2/C2) There is no definitive guidance within LLNL to ensure consistency of approach and quality for Operational Readiness Reviews.

CONCERN: (TS.3-2) (H2/C2) Facility and schematic drawings do not completely conform to the requirements of LLNL Plant Engineering Policy and Operations Manual in regard to approvals and showing of correct "as-built" status.

CONCERN: (TS.5-1) (H2/C2) Ventilation exhaust streams which might contain hazardous materials are not all monitored or sampled to quantify releases, and the lack of monitoring/sampling has not been justified by documented analyses.

I. Packaging and Transportation

CONCERN: (PT.1-1) (H1/C1) The hazardous materials transportation program is fragmented, uncoordinated, inconsistent, ineffective, and not in compliance with DOE Orders.

CONCERN: (PT.3-1) (H2/C1) The audit and appraisal program is insufficient in both frequency and depth to ensure that the quality assurance (QA) requirements of DOE 5480.3 and DOE 5700.6B are met.

CONCERN: (PT.3-2) (H2/C1) The system for corrective action and followup on packaging and transportation audits and appraisals does not comply with DOE Orders.

CONCERN: (PT.3-3) (H2/C1) The hazardous materials container procurement and inspection program does not provide assurance that containers will meet DOE Orders and Department of Transportation (DOT) regulations.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (PT.4-1) (H2/C1) There is no comprehensive and consistent sitewide program for ensuring that packaging, identification, and transportation of hazardous materials (on site, between sites, offsite) meet Department of Transportation (DOT) and Environmental Protection Agency (EPA) regulations, as required by DOE 5480.3, Section 7.

CONCERN: (PT.6-1) (H2/C1) CAT. II LLNL does not have a system for handling, identifying, and transporting packages of hazardous materials, in compliance with the safety policies and criteria prescribed in DOE 1540.1, DOE 5480.1, and DOE 5480.3, and in State and Federal regulations.

CONCERN: (PT.6-2) (H2/C1) CAT. II Shipping manifests do not consistently meet the Department of Transportation (DOT) and Environmental Protection Agency (EPA) regulations in that they do not provide the required information in the specified format.

J. Nuclear Criticality Safety

CONCERN: (CS.3-1) (H3/C2) The criticality safety evaluations performed by the Criticality Safety and Analysis Group do not always include a formal documentation of the review process.

CONCERN: (CS.5-1) (H2/C2) The sound levels of the criticality alarm system in Bldg. 332 do not conform with the recommendations of ANSI/ANS 8.3-1986.

K. Security/Safety Interface

CONCERN: (SS.1-1) (H2/C2) There exist several mechanisms by which facilities and equipment may be modified without receiving a Security/Safety review to the same codes, standards and criteria afforded the original design.

CONCERN: (SS.3-1) (H2/C2) The Protective Force Division Emergency Plan does not clearly establish lines of authority and responsibility under all applicable conditions.

CONCERN: (SS.3-2) (H2/C1) Safety limits have not been established as required by DOE 5480.16 for the use of security weapons and equipment near safety systems and hazardous material.

CONCERN: (SS.4-1) (H2/C1) The protective force training program and its implementation are not in compliance with Special Order 86-04, Security Emergency Response Team (S.E.R.T.), revised January 22, 1987, and DOE 5480.16.

CONCERN: (SS.4-2) (H3/C1) The protective force training records are not auditable, and therefore, do not provide demonstrated evidence of officer qualification in accordance with DOE 5480.16.

CONCERN: (SS.4-3) (H2/C1) The LLNL physical fitness training program for protective force officers is not in compliance with 10 CFR 1046.11.(d).

CONCERN: (SS.4-4) (H2/C2) Protective force officers do not receive training in the specific safety rules and hazards associated with some facilities and processes at LLNL.

L. Site/Facility Safety Review

CONCERN: (FR.1-1) (H2/C1) There is no fully functioning Safety Review Committee or collection of committees providing independent safety oversight for LLNL operations as required by DOE 5482.1B.

CONCERN: (FR.3-1) (H2/C2) The conduct of the Facility Safety Procedure and Operational Safety Procedure review and approval process at LLNL is not consistent with the health and safety hazard presented by the process being considered.

CONCERN: (FR.4-1) (H3/C1) The annual appraisal guidance provided in the Health and Safety Manual is not in compliance with DOE 5480.5.

CONCERN: (FR.4-2) (H2/C1) The LLNL Site Independent Review and Appraisal System is not in compliance with the requirements of DOE 5480.5, DOE 5480.1B, and generally accepted industrial practices.

CONCERN: (FR.5-1) (H2/C1) A formal triennial review of the safety review system for LLNL operations is not conducted as required by DOE 5482.1B and DOE 5480.5.

CONCERN: (FR.6-1) (H2/C2) LLNL site management has not implemented a safety program that ensures the timely followup and closure of all safety items.

M. Radiological Protection

CONCERN: (RP.1-1) (H2/C1) There is an insufficient number of operational and administrative procedures to provide guidance in the detailed implementation of programs and to control interactions among the various radiation protection groups.

CONCERN: (RP.1-2) (H2/C2) Administrative and operational procedures are not consistently developed, reviewed, and approved.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (RP.2-1) (H2/C1) Audit plans of radiological activities do not ensure that all elements are addressed, including those specified in DOE 5482.1B, Section 9.d., and DOE 5480.11, Section 9.r.

CONCERN: (RP.2-2) (H3/C2) There is very little independence in internal radiation protection audit programs.

CONCERN: (RP.3-1) (H2/C2) The radiation work permit does not provide information to the worker on the radiological environment of the workplace.

CONCERN: (RP.3-2) (H1/C1) Radwaste containers and some controlled areas are not properly posted in accordance with DOE 5480.11.

CONCERN: (RP.6-1) (H2/C2) LLNL practices such as wearing half-face masks and permitting high hood airflow velocities may not properly control potential internal radiation exposures.

CONCERN: (RP.6-2) (H2/C1) Emergency respirator protection equipment is not being properly inspected in accordance with ANSI Z88.2.

CONCERN: (RP.7-1) (H2/C1) The bioassay sampling frequency and type, in combination with the air monitoring program, may not detect internal exposures to all radionuclides at the levels specified in the DOE draft Performance Standards for Internal Dosimetry Programs.

CONCERN: (RP.7-2) (H2/C2) The LLNL internal radiation dosimetry program does not meet the requirements of ANSI N13.30 for quality assurance and quality control.

CONCERN: (RP.8-1) (H2/C2) The calibration and maintenance for some of the fixed and portable instrumentation do not satisfy all requirements in ANSI Standards and good industry practices.

CONCERN: (RP.9-1) (H1/C1) The air monitoring systems may not reliably provide the information needed for an effective internal dose control program.

CONCERN: (RP.10-1) (H2/C2) Some work practices in a radiation environment do not ensure proper radiation control.

CONCERN: (RP.10-2) (H2/C1) Swipe counting procedures may allow the release of equipment above the smearable release limit specified in DOE 5480.11.

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (RP.11-1) (H2/C2) The ALARA principles were not incorporated during the handling and processing of the samples.

CONCERN: (RP.12-1) (H3/C2) Occupational radiation exposure records are not collected, stored, and retained in accordance with a uniform procedure or system.

N. Industrial Hygiene

CONCERN: (IH.1-1) (H2/C2) Industrial hygiene professional support to the Health and Safety Teams has not been sufficient to ensure effective identification and control of potential health hazards in the workplace.

CONCERN: (IH.1-2) (H2/C2) A significant number of Health and Safety Technicians have not been provided sufficient industrial hygiene training to ensure consistent implementation of the industrial hygiene program.

CONCERN: (IH.1-3) (H2/C1) Health and Safety Technicians are not sufficiently involved in routine operational research activities to minimize potential hazards or monitor the effectiveness of controls.

CONCERN: (IH.1-4) (H2/C2) LLNL does not have controls or effective procedures in place to facilitate consistent interpretation and implementation of the industrial hygiene program across organizational units.

CONCERN: (IH.2-1) (H2/C1) LLNL has not consistently implemented operational safety procedures to ensure that potential employee exposures to chemical and physical agents are maintained at levels consistent with the ALARA goals for the main site or with DOE 5480.10.

CONCERN: (IH.3-1) (H2/C1) LLNL has not implemented a uniform health hazard evaluation, control, and tracking program for potential sitewide health hazards.

CONCERN: (IH.3-2) (H2/C2) Operations at LLNL involving potential exposure to toxic agents and chemical carcinogens [i.e., metals (Be), solvents, and amine-based curing agents] are not evaluated in light of current personal protective equipment guidelines.

CONCERN: (IH.4-1) (H2/C2) The main site has not developed criteria for continuous performance-based indicators for high hazard exhaust ventilation systems.

CONCERN: (IH.5-1) (H2/C2) The LLNL implementation of a comprehensive asbestos control program is not consistent with internal LLNL guidelines and requirements of the ALARA program.

CONCERN: (IH.5-2) (H2/C2) LLNL has not completed a sitewide review of respirator usage, as recommended in the prescribed DOE standard, ANSI Z88.2.

CONCERN: (IH.6-1) (H2/C2) LLNL has not fully implemented all elements of the OSHA Hazard Communication Standard, 29 CFR 1910.1200, particularly those aspects of the Standard related to availability of Materials Safety Data Sheet (MSDS) labeling requirements, and maintenance of chemical inventory.

O. Occupational Safety

CONCERN: (OS.1-1) (H2/C2) LLNL has not implemented an effective independent oversight program for health and safety-related activities.

CONCERN: (OS.1-2) (H3/C1) LLNL administrative procedures for recording occupationally related illnesses do not ensure that all data reported to DOE/DOL are correct.

CONCERN: (OS.2-1) (H2/C1) Some hazardous activities are performed without written Operational Safety Procedures even though these are required by LLNL and/or mandatory requirements.

CONCERN: (OS.4-1) (H1/C1) CAT. II Plant Engineering controls over construction activities are not effective in ensuring that construction work conforms to OSHA requirements in 29 CFR 1926.

CONCERN: (OS.5-1) (H1/C1) The LLNL practices for ladder inspections, electrical installation and modifications, fire extinguisher inspections, portable power tool and cord inspections, and hoist inspections have not been effective in meeting DOE-prescribed occupational safety standards.

P. Fire Protection

CONCERN: (FP.1-1) (H2/C1) Because the fire protection program is divided among three separate groups, a unified fire protection program does not exist at the main site or Site 300 to meet the requirements of DOE 5480.7 and industry standard practices.

CONCERN: (FP.2-1) (H2/C1) The Life Safety Code analysis does not appear to have been followed precisely sitewide, to address the deviations from the existing requirements of the Life Safety Code, DOE Explosive Safety Manual, Uniform Building Code, and the LLNL Health and Safety Manual.

CONCERN: (FP.4-1) (H1/C2) The loss by fire in the cable run areas or from severe exposure from trailers 1701, 1702, or 1703 could result in the shutdown of a facility (Bldg. 1705).

APPENDIX B-2

Tabulation of Concerns (Cont'd)

CONCERN: (FP.5-1) (H2/C2) The recommendations contained in the Factory Mutual Research Corporation (FMRC) report are not being implemented in a timely manner. DOE has not granted exemptions from the FMRC report.

CONCERN: (FP.5-2) (H2/C2) The automatic sprinkler systems at Site 300 are not fully operational, and others cannot be considered reliable during subfreezing weather.

CONCERN: (FP.6-1) (H2/C1) Because the Site 300 Fire Department is not fully staffed, potential interior fire fighting activities are limited.

CONCERN: (FP.7-1) (H2/C1) Design review and planning are incomplete for new construction and building modifications involving fire protection and life safety.

CONCERN: (FP.7-2) (H2/C1) The preventive maintenance, inspection, and testing of fire systems and fire alarm systems is not in compliance with DOE 5480.7 and DOE 6430.1A.

CONCERN: (FP.7-3) (H1/C1) The deficiencies noted by Factory Mutual for Site 300 have not been addressed in a timely manner.

CONCERN: (FP.7-4) (H1/C1) The fire protection water supplies are considered insufficient per NFPA-13 and Factory Mutual Research Corporation (FMRC) Data Sheet 2-8N and unreliable at Site 300 due to deficiencies in the flow and pressure available, and in the valve inspection program. Deficiencies in the valve inspection program and the limited accessibility to the fire protection control valves make the water supplies at LLNL unreliable.

CONCERN: (FP.7-5) (H2/C1) CAT. II The sitewide fire alarm system is deficient in meeting requirements (NFPA-72D) for the use of listed or approved fire alarm equipment and does not provide for automatic notification to building occupants.

APPENDIX C

Team Composition and Areas of Responsibility

Technical Safety Appraisal
Lawrence Livermore National Laboratory

EH Senior Manager	Oliver D. T. Lynch, Jr. Office of Safety Appraisals Department of Energy
Subteam Leaders	Fredric D. Anderson Office of Safety Appraisals Department of Energy
	Richard H. Lasky Office of Safety Appraisals Department of Energy
Assistant Team Leaders	Albert D. Morrongiello Office of Safety Appraisals Department of Energy
	Bal M. Mahajan Office of Safety Appraisals Department of Energy
Organization and Administration	Andrew J. Pressesky Private Consultant
	Lorin C Brinkerhoff Private Consultant
Quality Verification	Henry P. Himpler, Jr. ARINC
	Charles Grua Office of Quality Programs Department of Energy
Operations/Experimental Activities	Ernest W. Johnson Private Consultant
	Leon H. Meyer Private Consultant
	William E. Mott Private Consultant
Maintenance	Lewis Masson SCIENTECH, Inc.

APPENDIX C (Cont'd)

Maintenance	Charles R. Jones SCIENTECH, Inc.
Training and Certification	Richard W. Vinther Battelle-Northwest
	Robert W. Tayloe, Jr. Battelle-Columbus
Auxiliary Systems	Woodson B. Daspit WBD Consulting Corp.
	Charles R. Jones SCIENTECH, Inc.
Emergency Preparedness	George Bailey Advanced Systems Technology
Technical Support	J. Kenneth Anderson Private Consultant
	William J. Zielenbach Battelle-Columbus
Packaging and Transportation	William Brobst The Transport Environment
Nuclear Criticality Safety	Adolf Garcia Argonne National Laboratory-West
Security/Safety Interface	Thomas L. Van Witbeck TOMA Enterprises
Site/Facility Safety Review	Thomas L. Van Witbeck TOMA Enterprises
	Robert W. Tayloe, Jr. Battelle-Columbus
Radiological Protection	Wayne Knox Advanced Systems Technology
	Joseph M. Garner Private Consultant
Industrial Hygiene	Michael C. Garcia Albuquerque Operations Office Department of Energy
	Robert D. Gilmore Environmental Health Sciences, Inc.

Occupational Safety	Ronald E. Alexander Environmental Management Associates
	Robert D. Gilmore Environmental Health Sciences, Inc.
Fire Protection	George Weldon Private Consultant
	Charles W. McKnight Westinghouse Idaho Nuclear Co., Inc.
Medical Services	Bernard S. Zager, M.D. Private Consultant

Report Support and Liaison:

Appraisal Coordinators	Mary Meadows Office of Safety Appraisals Department of Energy
	Fran Kimball Office of Safety Appraisals Department of Energy
	Rita A. Bieri Los Alamos National Laboratory
Assistant Coordinators in Training	Dee Young Office of Safety Appraisals Department of Energy
	Heidi Coblentz Office of Savannah River Restart Department of Energy
	Peggy Lewis Office of Quality Programs Department of Energy
Report Technical Editors	John W. Klinglhoefer Battelle-Columbus
	Pamela Gurwell Battelle-Northwest
SAN Liaison	Scott Samuelson San Francisco Operations Office Department of Energy
DP Program Liaison	Roy Lee Weapons Safety and Operations

DP Program Liaison	Roy Lee Weapons Safety and Operations Department of Energy

APPENDIX D

Biographical Sketches of Team Members

Technical Safety Appraisal
Lawrence Livermore National Laboratory

NAME: Oliver D. T. Lynch, Jr.

AREA OF RESP: EH Senior Manager

ASSOCIATION: U.S. Department of Energy Headquarters, Office of Safety Appraisals

EXPERIENCE: 26 years

- o U.S. Department of Energy, Germantown, Maryland
  - Director, Safety Inspections Division, OSA
- o U.S. Nuclear Regulatory Commission, Rockville, Maryland
  - Radiation Measurements and Health Effects Section Chief
  - Standardization and Decommissioning Section Chief
  - Safeguards and Non-Power Reactors Section Chief
  - Radiation Protection Section Leader
  - Senior Operating Reactor Project Manager
  - Environmental Assessment Section Chief, TMI Program Office
  - TMI Special Inquiry Group (Rogovin)
  - Senior Environmental Project Manager
- o International Atomic Energy Agency
  - Technical Working Group Leader, Vienna, Austria
  - Instructor, Cairo, Egypt
- o General Dynamics, Electric Boat Division, Groton, Connecticut
  - Chief, Radiological Control Health Engineering
- o U.S. Atomic Energy Commission, Las Vegas, Nevada
  - Radiological Specialist
- o San Diego State University, San Diego, California
  - Assistant Radiological Safety Officer

EDUCATION: B.S. Applied Physics, San Diego State University
M.S. Nuclear Physics, San Diego State University

OTHER: Member, Health Physics Society
Member, American Forestry Association
Sigma Pi Sigma
Author, Textbooks and Training Manuals, Small Craft Safety, Operations, and Navigation

NAME: Fredric D. Anderson

AREA OF RESP: Health and Safety Subteam Leader - Main Site LLNL

ASSOCIATION: U.S. Department of Energy Headquarters

EXPERIENCE: 36 years

- o Team Leader - Office of Safety Appraisals, Department of Energy
- o Private Consultant - Nuclear Safety of Power/Research Reactors
  - Technical Specifications
  - Prudency Reviews for Public Utility Commission Hearings
  - Preparation and Review of Safety Analysis Reports
  - Verification and Readiness Reviews of Power Plants for Licensing
  - Emergency Planning and Rad Protection Programs
- o U.S. Nuclear Regulatory Commission
  - Senior Reactor Engineer: Technical Specifications/Westinghouse Power Plants
  - Senior Nuclear Engineer: Regulatory Requirements/Siting Policy and Practices
- o U.S. Atomic Energy Commission
  - Lead Reactor Engineer: Operating Reactor Project Leader/Radiation Physics Specialist
  - Nuclear Engineer: Special Safety Concerns for Power Reactors; SNAP/ROVER/PLUTO Safety Reviews
- o Atomics International
  - Senior Research Engineer: Manager of SNAP Reactor Safety Programs (Experimental and Analytical)
  - Research Engineer: Shield Analyst for OMR and SGR Programs (Experimental and Analytical): Waste Disposal Systems and Hot Cells Design
- o U.S. Public Health Service
  - Commissioned Officer: Radiological Health Instructor and Editor of Publications; Operation Redwing Monitoring Team Member
- o N.C. State University - Physics Instructor

EDUCATION: B.S. Math/Physics, Purdue University
M.S. Engineering Physics, N.C. State University

OTHER: Marquis' Who's Who in the East
Leaders in American Science
Dictionary of International Biographies
Sigma Pi Sigma

NAME: Richard H. Lasky

AREA OF RESP: Health and Safety Subteam Leader - HEAF and Site 300

ASSOCIATION: U.S. Department of Energy Headquarters

EXPERIENCE: 16 years

- o U.S. Department of Energy
  - TSA Team Member, LBL, TSTA, ATR and Pantex
  - TSA Team Leader
- o U.S. Nuclear Regulatory Commission
  - Electrical Engineer, Instrumentation and Control Systems
  - Equipment Qualification and Test Engineer, Environmental Qualification Inspections
- o U.S. Department of the Navy, Norfolk Naval Shipyard
  - Nuclear/electrical engineer, Nuclear Engineering Department
  - Senior Engineer: Primary Plant instrumentation, Primary Plant Controls, Nuclear Instrumentations, Steam Generator Water Level Control, Temperature Monitoring, Reactor Protection and Alarms, Radiation Monitoring, SG Chemical Cleaning (Electrical)

EDUCATION: B.S. Electrical Engineering, Norwich University

OTHER: Member, Institute of Electrical and Electronic Engineers

NAME: Albert D. Morrongiello

AREA OF RESP: Assistant Team Leader - Main Site LLNL

ASSOCIATION: U.S. Department of Energy Headquarters

EXPERIENCE: 11 years

- o U.S. DOE - Assistant Team Leader in Safety Inspection Division
- o U.S. Nuclear Regulatory Commission - Resident Inspector
- o Environmental Protection Agency - Health Physicist

EDUCATION: B.A. Chemistry, University of Rhode Island
M.S. Biology, University of Richmond
M.S. Professional Management, Florida Institute of Technology
Additional Studies at Rutgers University - Department of Radiation Science

NAME: Bal M. Mahajan

AREA OF RESP: Assistant Team Leader - HEAF and Site 300

ASSOCIATION: DOE/Headquarters, Office of Safety Appraisals

EXPERIENCE: 27 years

- o U.S. Department of Energy, Germantown, Maryland
  - Assistant Team Leader for Technical Safety Appraisals of DOE Facilities
  - Team Member on FMPC TSA
- o National Institute of Standards and Technology
  - Principal Investigator for Experimental and Theoretical Research in:
    Gas Absorption Kinetics, Evaluation of Indoor Air Quality and Air Cleaning Equipment
    Hydraulics of Water Supply and Drainage Systems.
    Natural Convective Heat and Mass Transfer
    Hazard Analysis and Technical Rationale for developing Test Protocols and Safety Performance Standards for various products and equipment
- o University of Maryland
  - Teaching: Power Plant Design and Operations, HVAC Systems, Heat Transfer, Thermodynamics, and Mechanics
  - Research: Fluid Jet Mixing, Pollution from Power Plants, and Emissivity of Gas Particle Mixtures

EDUCATION: B.S. Physical Sciences, Panjab University, India
M.S. Mechanical Engineering, University of Maryland
Ph.D. Mechanical Engineering, University of Maryland

OTHER: Professional Engineer, State of Maryland
Member of ASME, ASHRAE, ATM, and World Safety Organization

NAME: Ronald E. Alexander

AREA OF RESP: Occupational Safety

ASSOCIATION: Environmental Management Associates

EXPERIENCE: 20 years

- o Environmental Management Associates
  - Hazardous Material Management Consultant providing OSHA compliance assistance, hazardous waste assistance, environmental liability assessments, Safety Analysis Reports, permitting assistance, and Technical Safety Assessment assistance
- o Mason & Hanger - Silas Mason Co., Inc.
  - Departmental Scientist responsible for managing 34 professionals in the areas of health physics, industrial hygiene, environmental protection, and waste management
  - Senior Health/Physicist/Industrial Hygienist responsible for supervision of health physics, industrial hygiene and environmental protection personnel
  - Area Safety Engineer responsible for performing industrial safety and explosive safety compliance reviews of weapons assembly area

EDUCATION: B.S. Texas Tech University
Graduate Work - West Texas University

NAME: J. Kenneth Anderson

AREA OF RESP: Technical Support

ASSOCIATION: Private Consultant

EXPERIENCE: 38 years

- o Manager, Safety Assessment Office, Westinghouse Hanford
- o Manager, Nuclear Safety, Westinghouse Hanford
- o Executive Secretary and member, Westinghouse Hanford Safeguards (Nuclear Facility Safety Review) Council
- o Nuclear Facility (reactor and nonreactor) design analysis, operations analysis, and safety analysis at Hanford
- o Member of six DOE-HQ Technical Safety Appraisal Teams
- o Classification Officer (2.5 years), Westinghouse Hanford

EDUCATION: B.A. Physics, University of Utah
Graduate courses in physics, mathematics, and reactor design analysis, University of Idaho

NAME: George P. Bailey

AREA OF RESP: Emergency Preparedness

ASSOCIATION: Advanced Systems Technology, Inc.

EXPERIENCE: 25 years

- o Advanced Systems Technology, Inc.
  - Manager, Emergency Preparedness
- o Stone & Webster Engineering Corp.
  - Senior Emergency Planning Analyst
- o Public Service of Indiana - Marble Hill NGS
  - Senior Emergency Preparedness Licensing Engineer
- o Louisiana Power & Light - Waterford 3 SES
  - Site Emergency Planning Coordinator
- o Nuclear Energy Services, Inc.
  - Manager, Protective Services

EDUCATION:
University of Philippines
Texis Community College
Hartford State Vocational College
NET Course, Sandia Base, New Mexico
Disaster Preparedness Instructor Course
CBR Warfare Instructor Course
Nuclear Weapons Basic Course
Nuclear Weapons Advance Recertification

OTHER:
AIF - Subcommittee on Siting, Licensing and Emergency Preparedness
AIF - Subcommittee on Safeguards
Society of Fire Protection Engineers

NAME: Lorin C. Brinkerhoff

AREA OF RESP: Organization and Administration

ASSOCIATION: Private Consultant

EXPERIENCE: 36 years

- o Nuclear Safety Technical Expert under contract to EG&G Idaho, Scientech, and Oak Ridge Associated Universities
- o Technical Safety Appraisal Team Leader, DOE, Office of Safety Appraisals
- o Reactor and Nuclear Facility Safety Specialist, AEC/ERDA/DOE
- o Senior Nuclear Engineer, Aerojet General Corporation, Nuclear Rocket Development Center (Nevada Test Site)
- o Reactor Foreman, Phillips Petroleum Co., Idaho Test Site
- o Graphite Research Analyst, Hanford Test Site, General Electric Company

EDUCATION: B.S. Chemical Engineering, University of Utah

OTHER: Past member of ANS-15 Standards Committee on Research Reactor Safety
Past Member of ANSI N-16 Standards Committee on Nuclear Criticality Safety
Listed in:
Who's Who in the East
Who's Who in the World

NAME: William A. Brobst

AREA OF RESP: Packaging and Transportation

ASSOCIATION: The Transport Environment, Inc., Kitty Hawk, NC

EXPERIENCE: 39 years

- o The Transport Environment, Inc. - President
  - Technical and management consulting in the field of hazardous materials transportation safety
- o Department of Energy - Director of Transportation Management
  - Developed and managed the agency program for R&D and risk management in energy/fuels transportation
  - Set policy and managed transportation operations
- o Atomic Energy Commission - Chief of Transportation
  - Developed and directed AEC's first centralized transportation management and R&D program
  - Set up a major package, vehicle, and safety system testing and risk analysis program
- o Department of Transportation - Deputy Director, Office of Hazardous Materials
  - Directed the DOT's technical program for hazardous materials safety regulatory development
- o U.S. Navy: Nuclear Weapons Officer
  - Radiological physics and dosimetry

EDUCATION: B.S. Chemistry, Northwestern University
Graduate work in Nuclear Engineering, University of Nevada and in Mathematics, University of Chicago

OTHER: Certified by American Board of Health Physics National Academy of Sciences' Committee on Transportation of Hazardous Materials (former Chairman)
Past Chairman of the Transport Advisory Group, IAEA DOE Independent Review Committee Member, TRU Waste Program

NAME: Woodson B. Daspit

AREA OF RESP: Auxiliary Systems

ASSOCIATION: W.B.D. Consulting Corporation

EXPERIENCE: 39 years

- o Consultant
  - Provide consulting services to DOE in the areas of reactor operations, auxiliary systems and technical support
  - Provide consulting services to Bechtel and Westinghouse on design of new low pressure, D_2O moderated production reactor
- o Du Pont, Savannah River Plant
  - Senior Reactor Associate for advanced studies
  - Process Associate for advanced studies: procedure enhancement, training, and simulator procurement
  - Chief Supervisor for reactor physics: hydraulics, heavy water technology, production reactor charge design, test reactor technical assistance, and production calculations (manual and automated)
  - Site Emergency Response Committee
  - Responsible for mechanical, electrical, and instrument assistance groups
  - Area Assistance: assigned in reactor building providing direct assistance to operating personnel, wrote incident reports, reviewed job plans, process improvements, etc
  - Shielding and Instrumentation Group Leader
  - Experimental Physics: startup of critical facility; construction checkouts; planning and performing experiments for application to production reactors
- o U.S. Naval Ordnance Test Station
  - High explosive research including use of very high speed photography

EDUCATION: B.S. Physics, Louisiana State University
M.S. Physics, Louisiana State University

OTHER: American Nuclear Society
Sigma Xi

NAME: Adolf S. Garcia

AREA OF RESP: Nuclear Criticality Safety

ASSOCIATION: Argonne National Laboratory

EXPERIENCE: 14 years

- o Criticality Safety Representative for the Reactor Experiments and Examinations Division
- o Served as the Nuclear Criticality Safety member of the Technical Safety Appraisal of the Savannah River Plant-Uranium Canyon and LLNL Plutonium Research Laboratory
- o Member of ANL Criticality Hazards Control Committee
- o Member of the ANL Nuclear Facility Safety Committee
- o Member of the Reactor Experiments and Examinations Division Safety Review Committee
- o Nuclear Criticality Safety and Fuels Management Engineer for the Hot Fuels Examination Facilities, ANL
- o Reactivity Worth of Material work with the Zero Power Plutonium Reactor, Applied Physics Division, ANL
- o Nuclear Material Safeguards and Security for the Hot Fuels Examination Facilities, ANL
- o Consultant to the U.S. DOE, Office of Nuclear Criticality Technology and Safety Project

EDUCATION: B.S. Physics and Nuclear Engineering, Louisiana State University
M.S. Nuclear Engineering, Louisiana State University

OTHER: Member of the Steering Committee of DOE's Nuclear Criticality Safety Analytical Methods Resource Center
Member of the Steering Committee of DOE's Nuclear Criticality Information System

NAME: Michael C. Garcia

AREA OF RESP: Industrial Hygiene

ASSOCIATION: DOE - Albuquerque Operations Office

EXPERIENCE: 16 years

- o Industrial Hygienist, Department of Energy, Albuquerque Operations Office
- o Manager, Health and Safety, General Electric Co., Aircraft Engine Group
- o Industrial Hygienist, General Electric Co., Aircraft Engine Group
- o Project Officer, NIOSH, Criteria Documents Development Branch
- o Industrial Hygiene Chemical Technician, LANL, HSE-5
- o Industrial Hygienist, U.S. Navy Reserve

EDUCATION: B.S. University of New Mexico
M.S. Central Missouri State

NAME: Joseph M. Garner

AREA OF RESP: Radiological Protection

ASSOCIATION: Private Consultant

EXPERIENCE: 43 years

- o Health Physics Private Consultant
- o Monsanto Research Corporation, Mound Laboratory
  - Provided field evaluations of in process radiation protection activities at the Rocky Flats Plant
  - Captain of US DOE Radiological Assistant Team and Broken Arrow Radiological Response
  - Supervised 25 to 35 health physics technicians and decontamination workers

EDUCATION: Lindsay Wilson Jr. College, 1939-41
University of Dayton, 1947-50

OTHER: Health Physics Society

NAME: Robert D. Gilmore

AREA OF RESP: Personnel Protection

ASSOCIATION: Environmental Health Sciences, Inc. (EHS)

EXPERIENCE: 15 years

- o President, EHS
  - Engineering and technical services firm specializing in environmental and safety sciences
- o Participated in TSAs at the FMPC, Y-12, PANTEX, Hanford, WDP, LLNL, SNL, ATR, RFP, GEND and Kansas City facilities
- o Hanford Environmental Health Foundation
  - Director of Operations and Planning: Providing comprehensive occupational and environmental health services including programs in occupational medicine, nursing, psychology, research, and environmental sciences
  - Department Manager: For industrial hygiene services, environmental monitoring, and analytical chemistry
- o Union Carbide Corporation
  - Corporate Staff: Headquarters staff providing technical direction and program guidance to multi-national operating components in health, safety, and environmental affairs
  - Manager of Industrial Hygiene Department: Oak Ridge Gaseous Diffusion Plant
- o U.S. Atomic Energy Commission/U.S. ERDA
  - Safety and Industrial Hygiene Engineer; Richland Operations Office

EDUCATION: B.S. Environmental Health, Chemistry; University of Washington
M.S. Industrial Hygiene, University of Washington

OTHER: Certified in Comprehensive Practice of Industrial Hygiene by the American Board of Industrial Hygiene

NAME: Charles Grua

AREA OF RESP: Quality Verifications

ASSOCIATION: U.S. Department of Energy Headquarters, Office of Quality Programs (OQA)

EXPERIENCE: 32 years

- o Quality Assurance Engineer, OQA/DOE
  - Participate as a team member or team leader in DOE QA Appraisals, TSA and Tiger Teams appraisals
- o Environmental Control Technology Specialist, ERDA/DOE
- o Program Manager, Department of Interior, Office of Coal Research
- o Acting Chief, Plant Engineering and Project Management Division, Department of Interior, Office of Saline Water
- o Resident Manager, Various Sites of Office of Saline Water, Department of Interior
- o Maintenance Engineer Section, National Institute of Health, Department of Health, Education, and Welfare
- o Honeywell Applications Engineering
- o Third Assistant Engineer, Lykes Brothers Steamship
- o U.S. Navy-Atlantic Fleet-Boiler and Machinery Officer

EDUCATION: B.S. Marine Engineering, U.S. Merchant Marine Academy

OTHER: American Society Mechanical Engineers
American Society for Quality Assurance

NAME: Pamela L. Gurwell

AREA OF RESP: Report Technical Manager

ASSOCIATION: Battelle-Northwest Division

EXPERIENCE: 7 years

- o Battelle-Northwest Division
  - Supervisor, Technical Communications
  - Editor-in-residence, Materials and Chemical Sciences Center
  - Technical editor for DOE Restart Readiness Review of High-Flux Isotope Reactor, Oak Ridge National Laboratory
  - Technical editor for DOE Safety Evaluations of N Reactor, PUREX, and Savannah River Reactors
  - Technical editor for Brookhaven TSA
  - Lead editor, public comment volume, Hanford Defense Waste Environmental Impact Statement and Surplus Production Reactor Decommissioning Environmental Impact Statement

EDUCATION: B.A. English, University of Rochester
M.A. English, University of Virginia

NAME: Henry P. Himpler, Jr.

AREA OF RESP: Quality Verification

ASSOCIATION: ARINC Research Corporation

EXPERIENCE: 34 years

- o Health and Safety Subteam Member - Mound Tiger Team
- o TSA Team Member - N Reactor, PFP, Hanford Tank Farm, NPR, SPR, BNL, and HFIR
- o Test and Evaluation Systems Engineering, Management and Design - Westinghouse Corp. and Raytheon Co.
- o QA Project Engineer and Project Manager - Westinghouse and General Electric Co.
- o Consultant to DOE in QA Program Planning and Auditing - ARINC Research Corporation
- o Consultant to U.S. Navy Weapon Systems/Project Management, Planning and Auditing - ARINC Research Corporation
- o Electronic Systems Design Engineering - Westinghouse Corporation

EDUCATION: B.S. Electrical Engineering, Johns Hopkins University
B.S. Industrial Technology, Rogers Williams College

NAME: Ernest W. Johnson

AREA OF RESP: Operations

ASSOCIATION: Private Consultant

EXPERIENCE: 25 years

- o Technical Expert under contract to Oak Ridge Associated Universities and EG&G Idaho
- o Participant on nine Technical Safety Appraisals, Rocky Flats Plant (707, 771, and 776/777), PANTEX, LANL TA-55, LLNL-332, FMPC, WVNS, and GEND
- o Consultant to DOE in Aerospace and Facility Nuclear Safety
- o Consultant to EG&G-MAT in numerous technical and programmatic areas
- o Part-time Instructor, University of Dayton
- o Monsanto Research Corporation, Mound Facility
  - Aerospace and Terrestrial Heat Source Design, Testing, and Safety Areas
  - Plutonium-238 and -239 technical studies for NRC and DOE
  - SAR and SARP generation for various plutonium-238 systems
  - Project Manager for numerous heat-source projects
  - Building Manager for plutonium facilities at Mound

EDUCATION: B.S. Chemistry/Mathematics, Wisconsin State College
M.S. Physical Chemistry, Iowa State University
Ph.D. Physical Chemistry, State University of Iowa

OTHER: American Chemical Society
American Society for Metals (ASM International)
Alpha Chi Sigma

NAME: Charles R. Jones

AREA OF RESP: Auxiliary Systems and Maintenance

ASSOCIATION: SCIENTECH Inc.

EXPERIENCE: 23 years

- o SCIENTECH Inc.
  - Senior Consultant: Provide senior level consulting for nuclear plant safety evaluations and reliability studies. Team coordinator for independent Criticality Safety Assessment at Rocky Flats Plant. Oversight of Savannah River Site Reactor Safety Improvement Program.

- o Tenera Corporation
  - Senior Project Manager: Assisted commercial nuclear plants in safety system functional assessments, technical troubleshooting, and operation reliability and safety. Evaluated safe shutdown and fire protection requirements for nuclear plants.

- o U.S. Department of Energy
  - Technical Advisor: On loan from Navy Nuclear Propulsion Program to Naval Advanced Weapons Program for troubleshooting and Comprehensive nuclear safety matters.

- o U.S. Navy, Nuclear Propulsion Mobile Training Team
  - Participated in team inspections of nuclear plants for Pacific Fleet Surface ships, auditing normal and emergency operations, chemistry and radiological controls, maintenance and administration.

- o Nuclear Powered Cruiser Bainbridge
  - Operating Officer

- o Nimitz Precommissioning Unit
  - Reactor Mechanical Assistant

- o USS Enterprise
  - Station Officer

EDUCATION: B.S. U.S. Naval Academy
O.E. MIT
M.S. Mechanical Engineering, MIT

OTHER: Member, American Nuclear Society Certified Nuclear Chief Engineer (Naval Reactors)

NAME: John W. Klingelhoefer

AREA OF RESP: Technical Editor

ASSOCIATION: Battelle - Columbus Operations

EXPERIENCE: 18 years

- o Battelle Columbus Operations
  - Projects Manager: Participated in TSAs for Hanford Tank Farm, Portsmouth Gaseous Diffusion Plant, and Lawrence Livermore National Laboratory; security Inspections for U.S. DOE weapons production facilities
  - Nuclear fuel cycle safety and security studies for U.S. NRC fuel production facilities and protection of spent fuel and high level waste in transit
- o Washington Public Power Supply System
  - Manager Safeguards: Safety and security systems design and integration, emergency preparedness planning and safeguards contingency planning
  - Responsible for personnel, administrative and physical protection of commercial nuclear reactors
- o NUSAC, Inc.
  - Senior Technical Associate: Developed design criteria and specifications for integrating safeguards and security systems for DOE and NRC facilities
- o Captain, Field Artillery
  - Commanded nuclear weapons detachment, responsible for all nuclear safety and security requirements

EDUCATION: B.S. Engineering, U.S. Military Academy

OTHER: Certified Protection Professional, American Society for Industrial Security
Member, IEEE Subcommittee on Physical Security

NAME: Wayne Harrison Knox

AREA OF RESP: Radiological Protection

ASSOCIATION: Advanced Systems Technology, Inc.

EXPERIENCE: 25 years

- o Advanced Systems Technology, Inc.: Senior Health Physicist/Emergency Planner -- Provided special consultation to the NRC in the development of Regulatory Guide in health physics, the development inspection plans and the evaluation of emergency preparedness programs. Provided consultation to nuclear power plants in the development and implementation of health physics and emergency preparedness programs.

- o Institute of Nuclear Power Operations -- Project Manager of Emergency Preparedness -- Developed guidelines for development and evaluation of emergency preparedness programs.

- o Battelle Northwest -- Internal Radiation Safety Auditor -- Conducted radiation safety inspections.

- o Westinghouse Hanford -- Operational Health Physics Analyst - developed radiation safety programs and evaluated safety conditions. Radiation Tech Supervisor - managed radiation safety program.

- o U.S. Army Reserve -- Nuclear Medicine Scientist

- o USAF -- Radiation & Optical Physics Project Manager

EDUCATION: B.S. Physics, Clark College
M.S. Nuclear Engineering/Health Physics, Georgia Institute of Technology

OTHER: Health Physics Society
American Nuclear Society
ANSI Certified Lead QA Auditor

NAME: Lewis S. Masson

AREA OF RESP: Maintenance

ASSOCIATION: SCIENTECH, Inc.

EXPERIENCE: 37 years

- o SCIENTECH, Inc.
  - Senior Associate: provide technical assistance to U.S. DOE and U.S. NRC in the fields of mechanical and nuclear engineering
- o EG&G Idaho, Inc.
  - Technical support to Office of Defense Energy Projects
  - Program Manager for the Fusion Engineering Program
  - Division Manager for the Loss-of-Fluids Test (LOFT) Engineering Support Division
- o Aerojet Nuclear Company
  - Manager, Special Reactor Projects, Design Engineering
- o General Electric Company
  - Manager, engineering activities for advanced nuclear propulsion systems
  - Project engineer during recovery of the damaged SL-1 reactor at INEL
  - Manager of test facilities and activities for Aircraft Nuclear Propulsion Program

EDUCATION: B.S. Mechanical Engineering, University of California, Berkeley
M.S. Nuclear Engineering, University of Idaho

OTHER: Member of America Nuclear Society and Fusion Energy Division Executive Committee

NAME: Charles W. McKnight

AREA OF RESP: Fire Protection

ASSOCIATION: Westinghouse Idaho Nuclear Company

EXPERIENCE: 9 years

- o Westinghouse Idaho Nuclear Company
  - Project Manager, Fire Protection Upgrade Projects: Responsible for coordinating all phases of a project to upgrade existing and install new fire protection equipment.
  - Senior Fire Protection Engineer: Conducted plant inspections for fire protection; developed preventive maintenance program for fire protection systems; provided fire protection and safety design input; and design new and test existing fire protection systems.
- o Factory Mutual Engineering, Bellevue, Washington
  - Loss Prevention Consultant: Conducted field inspection and analysis of various industries throughout the Pacific Northwest and Western Canada for protection against fire, flood, collapse, and earthquake.
- o HKM Associate Engineering, Billings, Montana
  - Assistant Engineer: Conducted dam safety studies; developed computer program for continuous center pivot irrigation; and designed drainage intercept system.

EDUCATION: B.S. Agriculture Engineering, Montana State University

OTHER: Member, NPSE, NFPA, and ICBO.
Registered Fire Protection Engineer, State of Montana

NAME: Leon H. Meyer

AREA OF RESP: Experimental Activities/Operations

ASSOCIATION: President, The LHM Corporation

EXPERIENCE: 37 years

- o Technical expert under contract to Oak Ridge Associated Universities and EG&G Idaho; served on 26 Technical Safety Appraisals for DOE/EH
- o Savannah River Plant, E.I. Du Pont de Nemours & Company, Aiken, SC
  - Program Manager: Responsibility for Safeguards and Security, Long-Range Planning, Budget Coordination, Quality Assurance, Environmental Control, Energy Conservation, and Away-from-Reactor Spent Fuel Storage
- o Atomic Energy Division, E. I. Du Pont de Nemours & Company
  - Program Manager, Technical Division: Responsibility for the Defense Waste Processing Facility and the LWR Fuel Reprocessing Design Project
- o Savannah River Laboratory, E. I. Du Pont de Nemours & Company, Aiken, SC, Assistant Director
- o Savannah River Laboratory, E. I. Du Pont de Nemours & Company, Aiken, SC, Director, Separations Chemistry and Engineering Section
- o Savannah River Laboratory, E. I. Du Pont de Nemours & Company, Aiken, SC, Research Manager, Separations Chemistry Division
- o Savannah River Laboratory, E. I. Du Pont de Nemours & Company, Aiken, SC
  - Research Supervisor, Separations Engineering Division: Responsibilities in areas of chemical separations; plutonium, uranium, and thorium processing; and tritium technology
  - Research Engineer, Separations Engineering Division

EDUCATION: B.S. Chemical Engineering, Georgia Institute of Technology
M.S. Chemistry, Georgia Institute of Technology
Ph.D. Physical Chemistry, University of Illinois

NAME: William E. Mott

AREA OF RESP: Operations

ASSOCIATION: Private Consultant

EXPERIENCE: 36 years

- o Private Consultant
  - Participated in DOE Technical Safety Appraisals of the Lawrence Berkeley Laboratory and the Naval Petroleum Reserve No. 1, and in a series of firearms safety appraisals at various DOE facilities
- o U.S. Department of Energy, Germantown, MD
  - Retired Annuitant: Served as technical safety expert to the Director, Office of Operational Safety, on oversight and appraisal activities relating to safeguards and security and the packaging and transportation of hazardous materials
  - Deputy and Senior Technical Advisor to the Director, Office of Operational Safety
  - Director, Division of Environmental and Safety Engineering
  - Director, Division of Public Safety
- o U.S. Energy Research and Development Administration, Germantown, MD
  - Director and Assistant Director for Nonnuclear Programs, Division of Environmental Control Technology.
- o U.S. Atomic Energy Commission, Germantown, MD
  - Assistant Director for Technical Programs, Division of Isotopes Development
- o Gulf Research and Development Company, Pittsburgh, PA
  - Research Scientist and Manger of Nuclear Applications

EDUCATION: B.S. Physics, College of Wooster
M.S. Physics, Carnegie-Mellon University
Ph.D. Physics, Carnegie-Mellon University

OTHER: Author or coauthor of 96 publications and reports
Eight patents
American Physical Society, American Nuclear Society, Sigma Xi, and Phi Beta Kappa

NAME: Andrew J. Pressesky

AREA OF RESP: Organization and Administration

ASSOCIATION: Private Consultant

EXPERIENCE: 43 years

- o Consultant to U.S. Department of Energy
  - Participated in Technical Safety Appraisals at Y-12 (ORNL), HFBR (BNL), EBR-II (ANL), ATR (EG&G), Strategic Petroleum Reserve and Feed Materials Production Center; design reviews for the N- Reactor, HFIR (ORNL) and SRP (SRL); management review of ORNL and followup of Y-12 and ATR appraisals
- o Consultant to Architect Engineer
  - Reviewed Nuclear Quality Assurance Program at company headquarters and at three commercial reactors under construction
- o Consultant and staff assistant to the American Nuclear Society Committee on the Source Term
- o U.S. Department of Energy (DOE)
  - Director, Office of Quality Assurance, Safety and Safeguards, Office of Assistant Secretary for Nuclear Energy
- o Milletron, Inc.
  - Vice President, Engineering
- o Westinghouse Electric Corporation
  - Manager, Scientific Support, Westinghouse Testing Reactor
- o Isotope Products, Ltd.
  - Technical Director
- o National Research Council of Canada
  - Manager, Critical Experiments Program

EDUCATION: B.E. Engineering Physics, University of Saskatchewan, Canada

NAME: Robert W. Tayloe, Jr.

AREA OF RESP: Emergency Preparedness/Training and Certification

ASSOCIATION: Battelle - Columbus Operations

EXPERIENCE: 10 years

- o Battelle, Principal Research Scientist
  - Criticality Safety and Training
  - Radiation Safety
  - Dosimetry
  - Participated in six Security Inspections and Evaluations of DOE Facilities
  - Participated in eight previous Technical Safety Appraisals
- o Portsmouth Gaseous Diffusion Plant, Nuclear Criticality Safety Staff
  - Member of Nuclear Safety Committees
  - Conducted audits, training, analysis, interface with operations and engineering, instrumentation, and resolution of inventory differences
  - Developed emergency drills, participated in Emergency Management Exercises, Member of Emergency Preparedness Committee

EDUCATION: B.S. Nuclear Engineering, North Carolina State University
Completed course work toward M.S. in Nuclear Engineering, Ohio State University

OTHER: Lectured on "Safety in Handling UF_6," 1983-1985 for DOE Office of Nuclear Safety seminar on Prevention of Significant Nuclear Events
Professional Engineer, State of Ohio

NAME: Thomas L. Van Witbeck

AREA OF RESP: Site/Facility Safety Review and Security/Safety Interface

ASSOCIATION: TOMA Enterprises

EXPERIENCE: 30 years

- o TOMA Enterprises
  - General Manager: provide services to government and commercial nuclear industry in the areas of operations, maintenance, and safety
- o SCIENTECH, INC.
  - Provided project management and technical consulting services to government agencies and the utility industry
- o PLD Energy Services
  - Vice President: supported nuclear plant operations
- o Energy Incorporated
  - Vice President: provided maintenance management systems, plant operations and quality assurance services
  - Director: management and quality assurance audits and technical support of nuclear utilities
  - Group Manager: onsite team to assess the Three Mile Island accident
  - Principal Consultant: technical support of commercial reactors and DOE facilities and programs
- o Westinghouse Electric Corporation
  - Shift Supervisor/Supervisory Engineer: commercial nuclear plant start-up and testing
- o Oregon State University
  - Reactor operator and health physicist
- o U.S. Navy
  - Petty Officer in charge of water chemistry and radiological programs aboard USS Bainbridge DLGN25.
  - Instructor U.S. Navy Nuclear Power School

EDUCATION: U.S. Navy Engineering Laboratory Technician School
U.S. Navy Nuclear Power School
B.S. Nuclear Engineering, Oregon State University

OTHER: Registered Professional Engineer
Licensed Reactor Operator (OP-2315)

NAME: Richard W. Vinther

AREA OF RESP: Training and Certification

ASSOCIATION: Battelle-Northwest Division

EXPERIENCE: 13 years

- o Battelle-Northwest Division
  - NRC Certified Contract examiner for operator licensing program
- o UNC Nuclear Industries, Inc.
  - Certified reactor operator, N Reactor
  - Systems certification instructor for N Reactor
  - N Reactor lead simulator instructor
  - Supervised development and training programs for N Reactor
  - Conducted appraisal of training and certification activities for the TSA at Brookhaven National Laboratory (DOE)
  - Conducting evaluation of Savannah River Restart program for DOE-HQ

EDUCATION: B.A. Business Administration, University of Puget Sound

NAME: George E. Weldon

AREA OF RESP: Fire Protection

ASSOCIATION: Private Consultant

EXPERIENCE: 37 years

o Factory Mutual Research Corporation, Norwood Mass

- Served on Technical Safety Appraisals for FFTF, N Reactor, Savannah River Plant Production Reactors, Livermore Plutonium and Tritium Plants, Idaho Chemical Processing Plant and Plutonium Finishing Plant, Sandia Albuquerque, Allied Signal Kansas City, and Mound Laboratories.
- Manager of Special Hazards Section.
- Engineering Specialist, Special Hazards. Responsible for fire and explosion hazards connected with major industrial occupancies, chemical and nuclear facilities.
- Concurrent with all of the above, MAERP Reinsurance Association Engineering Manager for approximately the past 15 years.
- Chairman of NFPA Atomic Energy Committee for about 12 years and member since its inception.

EDUCATION: B.S. Chemistry with minors in Physics and Mathematics, Northeastern University

OTHER: Registered Professional Engineer (Fire Protection), Massachusetts

NAME: Bernard S. Zager, M.D.

AREA OF RESP: Medical Services

ASSOCIATION: Private Consultant

EXPERIENCE: 36 years

- o Medical Officer - Mobile Army Surgical Hospital (MASH), Korea
- o Private practice medicine and surgery
- o Chief Physician, Automotive Assembly Division, Ford Motor Company
- o Medical Director and Manager Health and Safety Operation, General Electric Company Nuclear Energy Operation
- o Consultant Occupational Medical Programs

EDUCATION: B.A. Wayne State University
M.D. Northwestern University
Intern and Resident, Detroit Grace Hospital

OTHER: Certified Occupational Medicine, American Board of Preventive Medicine
Fellow American College Occupational Medicine
Fellow American College Preventive Medicine

NAME: William J. Zielenbach

AREA OF RESP: Technical Support

ASSOCIATION: Battelle - Columbus Operations

EXPERIENCE: 33 years

o Battelle

- Technical Assurance Manager, D&D Battelle Columbus Nuclear Material Facilities
- Staff Scientist: Security Evaluations (3) and Technical Safety Appraisals (10) of DOE facilities; nuclear package QA
- Project Manager: Nuclear fuel cycle case studies and facility safety analysis
- Project Leader and Team Member: Various programs for design and operation of irradiation experiments for Materials Testing Reactor, Engineering Test Reactor, Battelle Research Reactor, Experimental Breeder Reactor-11, University of Michigan Reactor (fueled and nonfueled)
- Researcher: Development of high-temperature air frame bearings and seals, and naval bearings. Materials development for aircraft nuclear propulsion program

EDUCATION: B.S. Chemical Engineering, University of Pennsylvania
M.S. Nuclear Engineering, Ohio State University

OTHER: Member, American Nuclear Society

* U.S. G.P.O.:1991-281-714:40024

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