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OAK RIDGE
NATIONAL
LABORATORY

MARTIN MARIETTA



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**Chemical Technology Division
Comprehensive Self-Assessment and
Upgrade Program (CSAUP)
Performance Objectives and Criteria**

OAK RIDGE NATIONAL LABORATORY

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CHEMICAL TECHNOLOGY DIVISION

COMPREHENSIVE SELF-ASSESSMENT AND UPGRADE PROGRAM (CSAUP)

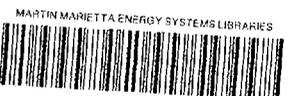
PERFORMANCE OBJECTIVES AND CRITERIA

ISSUES EVALUATION COMMITTEE

J. R. Hightower, Chairman
T. K. Bayles
J. T. Bell
E. D. Collins
C. E. Lamb
K. H. Lin
B. D. Patton
V. C. A. Vaughen

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Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
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CONTENTS

	<u>Page</u>
INTRODUCTION	vii
ORGANIZATION AND ADMINISTRATION	1
OA.1 Planning	1
OA.2 Organization	2
OA.3 Performance	2
OA.4 Control	3
OPERATIONS AND EXPERIMENTAL ACTIVITIES	5
OP.1 Conduct of Experimental Activities/Operations	5
OP.2 Personnel Performance	6
OP.3 Procedures and Documentation	7
OP.4 Human Factors	8
OP.5 Shift Turnover	9
OP.6 Status Controls	9
OP.7 Work Areas, Equipment, and Instrumentation	10
OP.8 Personnel Interfaces	11
MAINTENANCE	12
MA.1 Maintenance Organization and Administration	12
MA.2 Material Condition of Facility	12
MA.3 Conduct of Maintenance	13
MA.4 Preventive Maintenance	15
MA.5 Maintenance Facilities, Equipment, and Materials	15
MA.6 Work Control System	16
MA.7 Procedures and Documentation	17
MA.8 Maintenance History	18
TRAINING AND CERTIFICATION	19
TC.1 Organization and Administration	19
TC.2 Facility Operations	21
TC.3 Personnel Protection	22
TC.4 Maintenance Personnel	23
TC.5 Criticality Safety	23
TC.6 Training Facilities and Equipment	24
TC.7 Quality Control Inspector and Nondestructive Examination Technician	24
AUXILIARY SYSTEMS	26
AX.1 Effluent Holdup and Treatment	26
AX.2 Solid Wastes	27
AX.3 Storage and Handling of Fissile Material	28
AX.4 Ventilation Systems	28
AX.5 Vital Supply Systems	29
AX.6 Engineered Safety Systems and Critical Design Features	30

CONTENTS

	<u>Page</u>
EMERGENCY READINESS	31
ER.1 Organization and Administration	31
ER.2 Facility Emergency Plan	32
ER.3 Emergency Response Training	33
ER.4 Emergency Facilities, Equipment, and Resources	34
ER.5 Emergency Assessment and Notification	34
ER.6 Personnel Protection	35
TECHNICAL SUPPORT	36
TS.1 Facility Modifications	36
TS.2 Organization and Administration	37
TS.3 Procedures and Documents	38
TS.4 Equipment Performance Testing and Monitoring	39
TS.5 Evaluation of Operating Experiences	39
TS.6 Environmental Impact	40
FACILITY SAFETY REVIEW	41
FR.1 Safety Review Committees	41
FR.2 Safety Review Topics	41
FR.3 Operation of Safety Committee	42
FR.4 Annual Facility Safety Review	42
FR.5 Triennial Appraisal of Facility Safety Review System	43
FR.6 Project Proposals	43
NUCLEAR CRITICALITY SAFETY	44
CS.1 Organization and Administration	44
CS.2 Use of Nuclear Criticality Safety Control Parameters	44
CS.3 Nuclear Criticality Safety Evaluation	45
CS.4 Operating Procedures and Criticality Safety Limits	45
CS.5 Criticality Alarm System and Emergency Procedures	46
RADIOLOGICAL PROTECTION	47
RP.1 Organization and Administration	47
RP.2 Internal Audits and Investigations	48
RP.3 Radiological Protection Procedures and Posting	48
RP.4 External Radiation Exposure Control Program	50
PERSONAL PROTECTION	51
PP.1 Chemical Contamination	51
PP.2 Hazard Communication	51
PP.3 Occupational Safety	52
FIRE PROTECTION	53
FP.1 Fire Protection	53

CONTENTS

	<u>Page</u>
TRANSPORTATION AND PACKAGING	55
TP.1 Management Policy and Directives	55
TP.2 Organization and Administration	56
TP.3 Communications	56
TP.4 Procedures	56
TP.5 Staffing and Professional Development	57
TP.6 Incident and Accident Investigation and Reporting	58
CONFIGURATION MANAGEMENT	59
CM.1 Organization and Administration	59
CM.2 Configuration Identification	59
CM.3 Verification of Existing Baseline Configuration	60
CM.4 Change Control Process	60
CM.5 Interface Control	60
CM.6 Document Control Process	61
DESIGN ADEQUACY	62
DA.1 Adequacy of Overall Design with Respect to Safety	62
DA.2 Ability to Achieve Design Objectives	62
DA.3 Ability of Design Control Process to Ensure Maintenance of Design Objectives	63
QUALITY ASSURANCE	64
QA.1 Quality Assurance Program and Organization	64
QA.2 Design Control	64
QA.3 Procurement Control	65
QA.4 Document Control	65
QA.5 Control of Processes	66
QA.6 Quality Problems and Corrective Action	66
CONTROL AND USE OF RADIOACTIVE AND HAZARDOUS PRODUCTS	67
ENVIRONMENTAL PROTECTION	68
EP.1 Environmental Releases of Nonradioactive Contaminants	68
EP.2 Environmental Releases of Radioactive Contaminants	69
EP.3 Spill Prevention, Control, and Countermeasure	69
EP.4 Toxic Substances Control	70
EP.5 Hazardous Waste Management	70
SECURITY SAFETY INTERFACE	71
SS.1 Facility Design Compatibility and Training	71
SS.2 Emergency Access	71
SS.3 Facility Planning for Security/Safeguards Emergencies	71

INTRODUCTION

The U.S. Department of Energy (DOE) has placed strong emphasis on a new way of doing business patterned on the lessons learned in the nuclear power industry after the accident at Three Mile Island Unit 2. The new way relies on strict adherence to policies and procedures, a greatly expanded training program, and much more rigor and formality in operations. Another key element is more visible oversight by upper management and auditability by DOE.

Although the Chemical Technology Division (Chem Tech) has functioned in a safe manner since its beginning, the policies and methods of the past are no longer appropriate. Therefore, in accordance with these directives, Chem Tech is improving its operational performance by making a transition to greater formality in the observance of policies and procedures and a more deliberate consideration of the interrelationships between organizations at ORNL. This transition to formality is vitally important because both our staff and our facilities are changing with time. For example, some of the inventors and developers of the processes and facilities in use are now "passing the torch" to the next generation of Chem Tech staff. Our facilities have also served us well for many years, but the newest of these are now over 20 years old! All have increasing needs of refurbishment and repair, and some of the older ones need to be replaced.

The Comprehensive Self-Assessment and Upgrade Program (CSAUP) has been patterned on a similar activity performed at the High Flux Isotope Reactor. Using the Draft DOE Performance Objectives and Criteria for Technical Safety Appraisals (May 1987) as a starting point, it was determined that 14 functional areas for evaluation listed in the report were suitable for Chem Tech use. An additional 5 functional areas were added for completeness since Chem Tech has a broader set of missions than a reactor facility.

The Performance Objectives and Criteria (POC) for each functional area in the DOE report were modified to reflect the unique operations of Chem Tech. A policy statement was written to serve as an overall guide, and the Performance Objective was written to give a clear indication of the materials covered in each category. The new functional areas added by Chem Tech were derived in a similar fashion. For each objective, a set of criteria was derived to provide measures of how well the objectives were attained. Each POC was approved by an Issues Evaluation Committee, composed of senior managers in Chem Tech.

Following this approval process, an assessment was made to compare Chem Tech's current practice with our objectives and policy statements. From this evaluation, a set of action items was identified to bring Chem Tech's practice into line with the focus on continuing improvement. Finally, the action items will be reviewed by the same committee, approved, and prioritized. A final round of approvals will be obtained on the division level prior to seeking funding and resources, scheduling, and performing the corrective actions.

This procedure, based on the lessons learned in the nuclear industry, will enhance Chem Tech's operational performance in some important ways, while maintaining the special factors that have allowed the Chem Tech staff to be creative and successful in the RD&D activities.

The Chemical Technology Division

The Chemical Technology Division performs its activities in five broad categories -- basic experimental research and development (R&D), applied experimental research, development, and demonstration (RD&D), studies and analyses (nonexperimental R&D), isotope production (with R&D capabilities), and nontechnical support. Chem Tech's strength comes from its staff members and their expertise. In many cases, these staff members are the people who invented what is being done -- they are the experts by virtue of discovery and development or application of the discoveries of others.

ORGANIZATION AND ADMINISTRATION

Policy

The Chemical Technology Division (Chem Tech) will be managed within the context of the Martin Marietta Energy Systems, Inc., system in a manner that ensures the safe operation of the facilities for which it is responsible so that it can accomplish its missions. A management system is developed to assure Energy Systems management and DOE sponsors that work is being conducted safely.

OA.1 PLANNING

The Chem Tech mission, objectives, policies, programs, and procedures are clearly defined.

Forecasting

1. A division long-range plan, including a long-range staffing plan, is developed.

Objectives

2. Martin Marietta Energy Systems, Inc. (Energy Systems), ORNL, and the Chemical Technology Division, section, and operating facility objectives are consistent and complementary.
3. Division objectives indicate a strong commitment to a safe and high-quality operation and safe work practices.
4. Specific objectives are established for each organizational unit.
5. Specific objectives are developed to address areas where improvement is needed.
6. Objectives are stated in measurable terms. Where appropriate, action plans with specific milestones are used to aid in tracking progress toward objectives.

Policies

7. Energy Systems' corporate policy clearly demands adherence to safety rules and regulations.
8. Appropriate policies exist to ensure that facilities operations manager controls support personnel operating in his facility.
9. A clear, written policy on drug and alcohol use is available to all employees, contractors, and visitors.

Programs

Fitness for Duty

10. Prospective employees are appropriately screened before assignment to work.
11. All employees are periodically provided with and have knowledge of appropriate information on drugs, alcohol, and other important aspects of the program.

12. Managers and supervisors are trained in techniques used to identify and handle personnel suspected of being unfit.
13. Personnel are encouraged to report drug and alcohol abuse or other physical or psychological conditions that could impair fitness for duty.
14. An employee assistance program is available to all personnel and is well publicized.
15. Compliance with facility policy on fitness for duty is a condition of subcontractor access to the facility.
16. Senior management support for the program is evident at all levels.

OA.2 ORGANIZATION

Chem Tech is organized as a part of ORNL to conduct its programs and operate its facilities safely.

Organizational Structure

1. The organizational structure is clearly defined and understood.

Delegating

2. The responsibilities and authorities of each management, supervisory, and professional position are clearly defined.
3. Tasks assigned to personnel are consistent with their defined duties.
4. Responsibilities are assigned for the achievement of specific objectives. Assignments reflect actions needed by each contributing department to achieve common objectives.

Developing Relationships

5. Facility personnel clearly understand their authority, responsibilities, accountabilities, and interfaces with supporting groups.

OA.3 PERFORMANCE

Chem Tech conducts its operations effectively and safely to accomplish its missions and objectives through effective decision making and communications and a qualified, trained, and motivated staff.

Selection and Development of Personnel

1. Staffing and resources are sufficient to accomplish all tasks.
2. A personnel management and acquisition program is effectively implemented.
3. Timely action is taken to anticipate and fill vacancies.
4. Selection of personnel to fill vacancies is based on merit and ability.
5. Appropriate job qualification requirements are established for all facility positions that affect safe and reliable operation.

6. Position incumbents meet the prescribed job qualification requirements.
7. The division has an approved and accredited training program.
8. Appropriate career advancement programs are used to develop the management, supervisory, and technical expertise of personnel.

Communications

9. There is an effective chain of communication in both directions between corporate and facility management.
10. Feedback on the status of compliance with safety standards and requirements is provided to the laboratory administrator.
11. Management shows evidence of involving facility personnel in formulating and executing safe practices so that the individual worker feels responsible for his own safety and the safety of co-workers. Operations personnel are actively encouraged to develop improved methods of meeting safety, quality, and productivity goals.
12. Personnel understand the actions necessary, within the scope of their duties and responsibilities, to achieve the objectives.
13. There is an effective system for dissemination to employees of information necessary for safe operations.
14. Receipt, review, and distribution of documents from sources outside the facility are properly controlled.
15. Preparation, review, approval, and distribution for use of documents originated within the facility are properly controlled and timely.
16. Instructions to the staff are kept current, and superseded or voided documents are removed from use.
17. Necessary documents are readily available at appropriate locations in the facility.
18. Instructions and other documents are properly stored and readily retrievable.

OA.4 CONTROL

Chem Tech maintains systems to measure, evaluate, and correct performance in fulfilling its mission and objectives.

Establishing Performance Standards

1. Indicators of operational performance are established and periodically assessed to enhance operational effectiveness.
2. Job qualification requirements are periodically reviewed, evaluated, and revised, as necessary.

Measuring Performance

3. Selected operational data reflecting facility performance are analyzed and trended, and the results are forwarded to appropriate levels of management. Data are reviewed, and necessary corrective actions are taken by management.

4. An employee performance appraisal program is effectively used to enhance individual performance.
5. Timely and effective corporate management actions to correct deficiencies in resources are taken when necessary.
6. Administrative controls are employed for activities that affect safe and reliable operations.
7. Unusual events are reported to and reviewed by management for safety implications according to ORNL procedures. Events are classified as unusual events in compliance with DOE 5484.1 and DOE 5000.3.
8. Timely and effective action is taken to track and correct identified deficiencies and to prevent recurrence by addressing their basic causes.
9. Safety performance information feedback system operates to keep facility supervision apprised of progress toward achieving objectives.
10. Management reviews are periodically conducted to assess progress toward achievement of objectives.
11. Managers and supervisors personally take part in monitoring and assessing facility activities.
12. Managers and supervisors conduct frequent facility tours and observations of work activities.
13. Management and supervisory assessment and improvement efforts are performance oriented and are conducted in a manner that reinforces the line functions of managers and supervisors.

OPERATIONS AND EXPERIMENTAL ACTIVITIES

Policy

The Chemical Technology Division will conduct its R&D project and supporting activities in a manner that will achieve and maintain safety and high quality.

OP.1 CONDUCT OF EXPERIMENTAL ACTIVITIES/OPERATIONS

Performance Objective

R&D projects and supporting activities will be conducted in a manner that will achieve and maintain safety and high quality.

Criteria

1. The responsibilities for process safety are well understood.
2. Personnel are attentive and responsive to equipment, containment facility, and building parameters and conditions.
3. Work area activities are conducted in a businesslike and professional manner.
4. Work area access is limited, and access to the "controls" area is restricted to appropriate personnel.
5. R&D project and supporting activities (such as equipment, containment facility, and building setup, maintenance, and modifications) are planned and properly authorized.
6. Instruction sheets and data sheets are utilized and followed.
7. Policies and guidance stress the importance of carefully following procedures and instructions from authorized sources and determining and reporting off-normal conditions.
8. Any hazards or unusual occurrences that develop from the process are immediately reported to management.
9. Conditions adverse to safety or health are promptly corrected, and measures are taken to preclude repetition. These conditions are reported in accordance with DOE Order 5484.1 (or DOE Order 5000.3 as appropriate).
10. Important experimental conditions are monitored and recorded to provide assurance that unsafe conditions do not develop (and have not existed).
11. Operating history indicates safe and reliable operation, as evidenced by items such as the following:
 - the absence of repetitious personnel errors, and
 - a minimum of forced process shutdowns necessitating reportable incidents.
12. Supervisors monitor operations to identify and correct problems and to ensure adherence to policies and procedures.

13. After each forced process shutdown necessitating a reportable incident, effective reviews are conducted prior to restart and include the following:
 - formal guidance that defines responsibilities and requirements for the reviews,
 - appropriately qualified personnel who take part in the reviews, and
 - restart criteria and decision authority that are established and followed.
14. A communications system is in place to ensure that procedure changes and safety notices are pointed out in a timely manner to all personnel. A mechanism is in place to ensure that such changes or information are read and understood.
15. Project logs are maintained, are informative, and include information on all off-normal conditions.
16. Personnel perform all tests and measurements required by Operational Safety Requirements that are within their scope of responsibility.
17. Management prepares and adheres to a documented and approved Quality Assurance Plan and monitors the effectiveness of its implementation.

OP.2 PERSONNEL PERFORMANCE

Performance Objective

Knowledge (education, experience, and training) and performance shall support safe and high-quality operation of the equipment and instrumentation for which persons are responsible.

Criteria

1. Personnel complete formal qualification prior to assignment to duties.
2. Personnel knowledge is evidenced by an appropriate understanding of areas important to assigned duties, such as:
 - process chemistry and flowsheets,
 - equipment systems and components,
 - procedures and operating practices, and
 - process control mechanisms.
3. Personnel are aware of recent procedure changes and plant modifications.
4. Personnel have a clear awareness of the potential for process disruption from unauthorized or improper changes in process variables.
5. Personnel follow good operating practices in conducting operations, including industrial safety and radiological protection.
6. Supervisors observe personnel proficiency and performance, including procedure usage and compliance, and give instruction when necessary.
7. Personnel are knowledgeable in appropriate lessons learned from previous operating experiences.
8. Personnel are capable of diagnosing off-normal and emergency conditions in their areas of responsibility.

9. Personnel exhibit an attitude and approach that reflect an awareness of abnormalities, unusual conditions or trends, and a determination to inquire into and follow up on indications of abnormalities and unusual conditions or trends.

OP.3 PROCEDURES AND DOCUMENTATION

Performance Objective

Procedures and documents shall provide appropriate direction and shall be effectively used to support safe activities.

Criteria

1. The preparation, review, approval, and revision of procedures and data sheets are properly controlled and auditable.
2. The guidance of applicable source documents (DOE Orders, etc.) is incorporated into procedures (e.g., contractor ES&H policy and guidelines, as well as vendor technical manuals).
3. Procedures are clear and concise, and they contain adequate information for users to understand and perform their duties effectively. For example:
 - Portions or steps of other documents that are used or referred to when performing a procedure are specifically identified in the procedure.
 - Special equipment or tools required for safe performance are specified.
 - The use and placement of notes and caution statements to promote error-free performance are appropriate.
4. Safety limits adequately bound the operation and are addressed appropriately in each procedure.
5. Procedures are reviewed and validated prior to use.
6. A policy governing the use of procedures is documented. The policy includes the following:
 - action to be taken when procedures are found to be inadequate for the intended tasks or when unexpected results occur;
 - directions for when procedures are to be used as general guidance are to be followed step by step, or require sign-off for each step;
 - identification of procedures required to be in hand when performing the activities to which they pertain;
 - action to be taken if procedures conflict or do not contain adequate guidance; and
 - operator authority to deviate from written procedures during an emergency, if necessary, to protect personnel and equipment.
7. Temporary changes to procedures, if used, are controlled to ensure the following:
 - appropriate review and authorization prior to use,
 - user awareness of applicable temporary changes, and
 - timely cancellation or incorporation into permanent procedures.
8. Procedures are readily available and clearly identified.

9. Documents, drawings, and other references are readily available, authorized, and properly controlled.
10. Sufficient time is provided for training before significant procedure changes or system modifications are put into effect.
11. Information and data are recorded and examined to evaluate unusual occurrences and trends that could lead to procedure and equipment changes.
12. Records of fissile material movements within the facility accurately indicate the situation at any instance and are auditable in accordance with DOE Order 5480.5, Section II.
13. The Operational Safety Requirements specify appropriate bounding conditions for the hazards presented by the operation.
14. Supplemental operating information, such as posted diagrams or posted special instructions, are properly authorized, dated, and otherwise controlled.

OP.4 HUMAN FACTORS

Performance Objective

Human-factor considerations shall be evident in the design of equipment systems, instrumentation and controls, and supporting displays to facilitate the observation and interpretation of instruments, alarms, and other information, as well as the operation and maintenance of equipment.

Criteria

1. Personnel are able to differentiate between annunciator lights providing status and those providing indication of an alarm condition.
2. Visual indication of normal and abnormal instrument and equipment conditions is consistent throughout the facility and can be readily interpreted.
3. Audible indications of abnormal conditions with differing degrees of severity are distinctively different.
4. Labeling of equipment and instrument conditions and settings throughout the buildings is clear and unambiguously interpretable.
5. When "understanding" deficiencies are identified, efforts are made to improve the ease of interpretation of instruments and equipment conditions and settings.
6. Operational aids are formally approved, controlled, and accurately reflect requirements.
7. A reliable communication system is available in all areas of the facility.
8. Work areas are properly lighted.
9. Markings on equipment and piping are readily visible.
10. Restricted clearances are adequately marked.

OP.5 SHIFT TURNOVER (WHERE APPLICABLE)

Performance Objective

Turnovers conducted for each shift station shall ensure the effective and accurate transfer of information between shift personnel.

Criteria

1. Each shift station uses a checksheet or similar method to guide the turnover process. Items covered include:
 - equipment removed from service, degraded or undergoing maintenance;
 - operations and/or testing that are completed, in progress, or scheduled;
 - review of log and data entries of the previous shifts; and
 - off-normal conditions, temporary procedures, and/or safety documentation changes that are new since the last shift.
2. Turnovers include a general review of the control boards and panels.
3. Supervisor turnovers include a review of those administrative records necessary to ensure an adequate transfer of knowledge about process and equipment status.
4. Time overlap between incoming and outgoing operators and supervisors is adequate to permit the orderly transfer of necessary information.

OP.6 STATUS CONTROLS

Performance Objective

Personnel shall determine the status of equipment and instrumentation needed to enable safe and high-quality R&D activities before starting and during performance of the R&D activities.

Criteria

1. Policies and procedures defining status controls are implemented. Adherence to operational safety requirements is stressed. Provisions for special situations such as maintenance projects, extended outages, and correction of abnormal conditions are included.
2. Checksheets or other comparable means are used to ensure that proper conditions are established for each process or supporting activity.
3. A configuration control system requires appropriate management approval of changes to equipment or process components.
4. Equipment status changes are appropriately documented and communicated to appropriate operating personnel in a timely manner.
5. Activities affecting the status of installed equipment and instrumentation are authorized by appropriate personnel.

6. The operating conditions of the equipment, containment facilities, and building are effectively monitored, and appropriate corrective action is initiated when required.
7. The number of alarms that are normally in an alarmed condition during operation is minimal.
8. Defective or out-of-tolerance instrumentation, alarms, and controls are identified and properly labeled, and corrective measures are taken in a timely manner.
9. Backup instrumentation, measurements, and readings are used when normal instrumentation is found to be defective or out of tolerance.
10. Logkeeping is timely and accurate and should adequately reflect activities and status.
11. Locks and tags are effectively employed for configuration control.
12. Procedures exist and are implemented to effectively control the placement of caution, warning, information, and other similar tags on equipment. Procedures shall include the following:
 - Tags are issued by appropriate personnel.
 - Tags of a procedural nature do not conflict with previously approved procedures.
13. Lock and tag status is periodically reviewed to ensure the following:
 - The scope of the lockout and tagout is still applicable.
 - The locks and tags are still needed.
 - Each tag is placed on the proper component.
 - Tagged equipment is in the proper position.
 - Only authorized tags are present on components.
 - The information on tags and tagout sheets is accurate, complete, and legible.
14. After maintenance or testing, verification of component position is performed for safety-related and other important equipment and instrumentation.
15. When appropriate, the sequence for conducting equipment restart is specified and understood.
16. Procedures exist and are implemented to control the placement, removal, and periodic review of temporary modifications such as electrical jumpers, mechanical jumpers, hoses, pipe blanks, and spool pieces.

OP.7 WORK AREAS, EQUIPMENT, AND INSTRUMENTATION

Performance Objective

Work areas, equipment, and instrumentation shall effectively support R&D activities.

Criteria

1. Physical characteristics, environmental conditions, and maintenance of work areas support safe and high-quality activities.
2. Equipment needed for R&D and supporting activities is readily available to operating personnel.

3. Communication equipment is reliable and provides necessary coverage.
4. R&D and supporting equipment is accessible for operation, monitoring, maintenance, and replacement.
5. Special equipment (e.g., local area hoists, ladders, and work platforms) is provided as needed.
6. Key equipment is labeled and readily identifiable where appropriate.
7. Cleanliness and order are evident.

OP.8 PERSONNEL INTERFACES

Performance Objective

Persons conducting work in laboratories, glove boxes, or hot cells shall have their relationship to the facility operating group clearly defined.

Criteria

1. All groups are properly staffed with qualified personnel who are familiar with building regulations.
2. Procedures and written instructions are provided to all personnel working within a building and clearly define their respective responsibilities for safety.
3. Shift personnel are given the name(s) of the day-shift personnel who are familiar with special projects and who shall be notified if unusual conditions develop (or begin to develop) or when the day-shift personnel are absent.
4. Shift personnel communicate with the day-shift personnel concerning special operational parameters that may affect the expected progression of any work that is normally done by special day-shift personnel but is continued to other shifts under the observance of shift personnel. The shift supervisor is kept informed.
5. Shift personnel responsible for the building operations communicate with other shift personnel working in the building concerning the work of those groups. The interface between the groups is clearly defined, with the personnel responsible for the building operations having primary responsibility for actions in an emergency situation.

MAINTENANCE

Policy

The Chemical Technology Division (Chem Tech) maintains its equipment, buildings, and facilities in a safe, reliable, and functional condition. The Plant & Equipment (P&E) and Instrumentation and Controls (I&C) Divisions at ORNL and the comparable divisions at the other Oak Ridge sites work closely with Chem Tech to accomplish this.

MA.1 MAINTENANCE ORGANIZATION AND ADMINISTRATION

Performance Objective

Chem Tech ensures effective implementation and control of maintenance activities.

Criteria

1. The organizational structure is clearly defined.
2. Staffing and resources are sufficient to accomplish assigned tasks.
3. Responsibilities and authority of each management, supervisory, and professional and craft position in both the maintenance and the Chem Tech organizations are clearly defined.
4. Personnel clearly understand their authority, responsibilities, and accountabilities and the interfaces between the two organizations.
5. Administrative controls are employed for maintenance activities that affect safe and reliable operation. Examples of such activities include isolation of equipment, scheduling of corrective and preventive maintenance, use of tools and lifting equipment, and use of measuring and test equipment.
6. Performance appraisals are effectively used to enhance safety, quality, and individual performance.
7. Maintenance, craft, and technical personnel are actively encouraged to develop improved methods of meeting safety and quality goals consistent with missions of Chem Tech facilities.
8. Indicators of maintenance performance are established and periodically assessed to enhance maintenance effectiveness.

MA.2 MATERIAL CONDITION OF FACILITY

Performance Objective

The required material condition of components and equipment will be maintained to support safe operation of the facility and to achieve high-quality workmanship.

Criteria

1. Integrity and efficient functioning of Mechanical systems and equipment are ensured. These mechanical systems and equipment include, but are not limited to:
 - instrumentation, control, and associated indicators;
 - electric and electronic equipment; and
 - mechanical operators, fasteners, and supports.
2. A method is established to indicate that material deficiencies have been identified and are tracked by the work control-type system.
3. Equipment, structures, and systems are properly preserved and insulated as required, and are provided with safety features.
4. Equipment areas are free of debris (from MC.1-1; Equipment condition). Maintenance work areas are kept in a clean and orderly condition (MA.5-6).

MA.3 CONDUCT OF MAINTENANCE

Performance Objective

Maintenance will be conducted in a safe and efficient manner to support facility operation.

Criteria

1. Maintenance activities at the facility are properly authorized and conducted under the direct control of the designated facility supervisor. Pre- and post-job briefings are effectively used.
2. Maintenance personnel exhibit an attitude in approaching their tasks that results in quality workmanship.
3. Maintenance personnel are attentive to identifying, and responsive to correcting, deficiencies with a goal of returning equipment/systems to an optimum material condition.
4. Managers and supervisors understand and observe maintenance activities to identify and correct any problems and to ensure adherence to facility policies and procedures.
5. Maintenance and facility managers and supervisors take an active role in ensuring that the ALARA principles are met. Likewise, operations, quality control, and radiation protection personnel are involved appropriately in maintenance activities.
6. Maintenance personnel are knowledgeable of applicable lessons learned from past facility and industry experiences.
7. Maintenance practices include the following:
 - employment of proper tools and protective devices,
 - exclusion of foreign materials and contaminants from open systems and equipment, and
 - orderly condition of work sites.

8. Lock and tag procedures are implemented to protect personnel or equipment during the installation and maintenance of equipment. These procedures meet the following conditions:
 - Proposed lock and tag alignments are prepared by qualified individuals. Lock and tag alignments are performed by persons knowledgeable of the affected systems and lockout and tagout procedures.
 - The adequacy of lock and tag alignments is verified by someone separate from the individual who prepared the alignment, using current (as-built) facility prints or other definitive and current documentation.
 - Locks and tags are authorized by a senior shift individual, and the sequence of lock and tag placement and removal is specified when appropriate.
 - The lock and tag status is verified by the person performing or supervising the work on locked-out or tagged-out equipment before the work is commenced.
 - Tags are uniquely identifiable from other tags in use at the facility.
 - Status indications, controls, switches, and labels are not obscured by tags.
9. Subcontract personnel perform maintenance under the same controls and procedures and to the same standards as in-house maintenance personnel.
10. Appropriate maintenance personnel are aware of postmaintenance test requirements and results and take corrective action as necessary.
11. Verification and documentation of the satisfactory completion of all maintenance work are required.
12. Maintenance rework is identified and periodically reviewed for generic implications, and appropriate corrective action is taken, as necessary, to minimize rework.
13. Maintenance is performed by or under the direct supervision of personnel who have completed applicable training and qualification associated with the tasks to be performed.
14. Knowledge of maintenance personnel is evidenced by an appropriate understanding of areas such as the following:
 - facility policies, guidelines, and procedures that affect their activities;
 - industrial safety;
 - radiological protection and ALARA;
 - good work, cleanliness, and housekeeping practices;
 - maintenance procedures;
 - specific technician work practices;
 - general facility layout;
 - purpose and importance of facility systems and major equipment; and
 - effect of work on facility systems.
15. Maintenance personnel are capable of troubleshooting equipment problems in an efficient manner in coordination with facility personnel. The underlying causes of recurring equipment failures are identified, and the generic implications are evaluated (from MC. 2-6).

MA.4 PREVENTIVE MAINTENANCE

Performance Objective

Preventive maintenance will contribute to optimum performance and reliability of systems and equipment important to facility operation.

Criteria

1. A preventive maintenance (PM) program, which includes that for systems and equipment affecting safe and reliable facility operation, is implemented as required.
2. Inspection, lubrication, and other maintenance activities are performed at appropriate intervals determined by vendor recommendations and operational experience.
3. The backlog of preventive maintenance is minimized. Preventive maintenance is not waived or deferred for extended periods of time without management approval.
4. Documentation of PM provides a record of work performed, responsible persons, associated data, and, where appropriate, the conditions of the equipment before and after PM.
5. The effectiveness of the PM program is periodically evaluated at an appropriate management level, and the results are used as the basis to make program improvements.
6. Predictive maintenance techniques (e.g., vibration analysis, oil analysis) are used to assess equipment performance.
7. A comprehensive surveillance testing program, which includes that for components and systems needed to ensure safe operation of the facility, is implemented as required.

MA.5 MAINTENANCE FACILITIES, EQUIPMENT, AND MATERIALS

Performance Objective

Maintenance facilities, equipment, and materials will effectively support the performance of maintenance activities.

Criteria

1. Maintenance facility size, location, and arrangement, including work-area lighting, promote the safe and effective completion of work. Maintenance facilities, equipment, and tools are maintained in good repair.
2. Adequate supply and quality of tools, equipment, repair parts, material, and consumable supplies are available to support maintenance requirements, and suitable storage is provided for them.
3. Material is inspected prior to acceptance and storage to ensure conformance to design requirements.

4. The quality of stored equipment, parts, and materials is maintained by preventive maintenance and environmental and shelf-life controls.
5. Proper engineering control and approval are obtained on any deviation from the design specifications for parts or material.
6. Materials are stored and identified in a manner that results in timely retrieval of requested items.
7. Safety-related parts and components are properly controlled, segregated, and identified in the storeroom.
8. Programs are implemented to order, receive, and issue proper parts and material for normal maintenance, outages, and modifications. Methods exist to ensure that stock levels are adjusted, as necessary, to meet maintenance needs.
9. Mechanisms are in place to provide for the expeditious procurement of parts and material on a high-priority basis when needed. A program is established for acquisition of replacement parts that are not available from the original supplier.
10. Stock records are maintained, purchase orders are tracked, and safety-related parts are readily traceable from purchase order to installation.
11. Parts and material are properly controlled, segregated, and identified during the interval between storeroom checkout and installation.
12. Contaminated tools are segregated from clean tools, and suitable facilities are available to decontaminate tools and equipment for reuse when feasible. Unserviceable tools and equipment are controlled to prevent use.
13. Measurement and test equipment is calibrated and controlled to ensure accuracy and traceability. The calibration status is readily apparent.
14. Standard instruments used in calibrations are appropriately controlled and have calibrations traceable to the National Bureau of Standards.

MA.6 WORK CONTROL SYSTEM

Performance Objective

The control of work will ensure that identified maintenance actions are properly completed in a safe, timely, and efficient manner.

Criteria

1. The work control system provides management with a ready means for determining the status of outstanding work orders and maintenance planning.
2. Management control of work is accomplished through the use of an effective priority system. The backlog of work is tracked and effectively managed.
3. Advanced planning is established for scheduled and unscheduled shutdowns and includes considerations such as work priority, system conditions, length of outage required, pre-staging of documents and materials, and coordination of support activities.
4. Work planning includes considerations such as material, tool, and manpower requirements; interdepartmental coordination; safety considerations; quality control

requirements; and actions needed to minimize personnel radiation exposures. The concept of ALARA is emphasized in planning all radiological work.

5. The work to be accomplished is clearly defined by the work order. The work order package identifies or includes applicable guidelines, procedures, special precautions to be followed when the work is on hazardous systems, and any requirements for special surveillance to be performed.
6. All maintenance and modification work is initiated only after proper authorization.
7. Postmaintenance requirements are clearly defined and include the following elements:
 - clearly written test instructions,
 - test acceptance criteria,
 - adequate test precautions and safety considerations,
 - test scope sufficient to verify the adequacy of work accomplished, and
 - system and equipment restoration.
8. Postmaintenance test results are documented and reviewed to ensure proper system/equipment performance prior to returning the system to service.
9. Completed work control documents are reviewed to verify proper completion of administrative requirements and to identify preventive maintenance program adjustments that may be needed.

MA.7 PROCEDURES AND DOCUMENTATION

Performance Objective

Maintenance procedures will provide appropriate directions for work and will be used to ensure that maintenance is performed safely and effectively.

Criteria

1. The preparation, review, approval, and revision of procedures and documents are properly controlled. Procedures are readily available and clearly identified.
2. Procedures are verified prior to use. Procedures are validated prior to use or during use, whichever is practical.
3. Work procedures, drawings, vendor manuals, and reference materials used in support of maintenance are technically accurate and up to date.
4. Documents, drawings, and other technical data are available, authorized, and properly controlled. Posted job performance aids of a procedural nature accurately reflect procedural requirements.
5. Documents used in lieu of procedures receive the same review and approval as procedures.
6. Procedures are clear and concise and should contain adequate information for users to understand and perform their activities safely and effectively.
7. Portions or steps of other documents used, or referred to, when performing a procedure are specifically identified in the procedure.

8. Hold points for quality and radiological control checks are included in procedures as needed.
9. A policy governing the use of procedures is implemented. The policy includes:
 - actions to be taken when procedures are found to be inadequate for the intended task or when unexpected results occur;
 - action to be taken if procedures conflict or do not contain adequate guidance;
 - directions for when procedures are to be used as general guidance, are to be followed step by step, or require sign-off for each step;
 - identification of procedures required to be in hand when performing the operation to which they pertain.
10. Temporary changes to procedures, if used, are controlled to ensure the following:
 - appropriate review and authorization prior to use,
 - user awareness of applicable temporary changes, and
 - timely cancellation or incorporation into updated procedures.
11. Special maintenance procedures are provided for equipment that is unusual or especially sensitive, or requires special maintenance skills.

MA.8 MAINTENANCE HISTORY

Performance Objective

Maintenance history will be used to support maintenance activities and to optimize equipment performance.

Criteria

1. Maintenance history records are maintained for all safety-related systems, equipment, and components, and are readily accessible.
2. Malfunctions, repairs, modifications, and inspection/test results are effectively documented.
3. Maintenance history records and operating experience are appropriately considered in planning for corrective maintenance, modifications, and preventive maintenance.
4. Maintenance history is utilized to identify and evaluate the trends and persistent maintenance problems. Appropriate corrective action is initiated.
5. Information related to the radiological aspects of maintenance is recorded for future use.

TRAINING AND CERTIFICATION

Introduction

The Chemical Technology Division (Chem Tech) is an R&D organization that includes radiochemical process R&D and nonradiochemical R&D. Chem Tech's primary strength stems from the diversity and flexibility of its staff members, and maximum flexibility requires that all of them be trained to work safely in both radiochemical and nonradiochemical areas. A primary difficulty for safe operations is the sharing of facilities with other divisions, especially those Chem Tech radiochemical R&D buildings that also house people who do not work with radioactivity. A CTD goal is that both Chem Tech and non-Chem Tech staff residing in such buildings are trained and certified for safe work and occupancy.

Policy

The training and certification activities within Chem Tech will be managed to ensure that characteristics of the program (e.g., accreditation, duration, frequency, and formality) are consistent both with the level of risk posed by the facility and with the frequency of significant change in the design and operation of the facility.

TC.1 ORGANIZATION AND ADMINISTRATION

Performance Objective

The training organization and administration shall ensure effective implementation and control of training activities.

Criteria

1. The organizational structure is clearly defined, including the responsibilities and authority of all personnel involved in managing, supervising, and implementing training.
2. Staffing and resources are sufficient to accomplish assigned tasks. Training staff members possess the necessary technical knowledge, experience, and instructional and developmental skills.
3. The authority, responsibilities, and accountabilities of the training staff personnel and the interfaces with other divisions are clearly defined.
- 4.¹ Training and qualification/certification requirements based on assigned job tasks are established for each work classification.

¹Indicators of training performance and results are established and periodically assessed to enhance training performance.

5. Classroom instructions are effectively presented, and instructor performance is routinely evaluated.
6. A training system is defined and implemented for accomplishing the following:
 - assessing trainee entry-level knowledge and skills,
 - identifying and documenting tasks to be included in training,
 - developing and modifying programs,
 - planning and scheduling training activities,
 - conducting on-the-job training,
 - administering and controlling examinations to minimize the possibility of compromise,
 - exempting personnel from training requirements,
 - providing remedial training, and
 - maintaining current training materials.
7. A systematic evaluation of training effectiveness is used to ensure that the training program conveys all required skills and knowledge and includes the following, as appropriate:
 - Written and oral examinations and quizzes are developed, administered, and controlled so that ensure learning objectives are accomplished.
 - Trainee participation in on-the-job training and laboratory training is monitored to ensure that performance requirements are met.
 - Feedback from job performance is used to evaluate and refine the training program.
- 8.¹ Records of each individual's training participation and performance are maintained (as applicable) in an auditable manner and include the following:
 - results of written and oral examinations;
 - question-and-answer keys to written and oral examinations; and
 - practical demonstration requirements, including an indication that each trainee carried out the required demonstration.
9. Training requirements for temporary employees, contract personnel, and transient workers are established and are appropriate for the tasks to be assigned.
10. Training personnel are actively encouraged to develop improved methods of meeting training objectives and goals.
11. Learning objectives that specifically define the skills and knowledge expected upon training completion are provided to instructors and students.
12. Training materials are adequate to support learning objectives.
13. Training and retraining schedules are maintained to keep all personnel adequately qualified and/or certified.
- 14.² The training program for supervisors and managers shall broaden overall familiarity of facility, procedures, and equipment.

²Institute for Nuclear Power Operations (INPO) criteria.

TC.2 FACILITY OPERATIONS

Performance Objective

The training and certification programs for operators (technicians) and supervisors (principal investigators) shall develop and improve the knowledge and skills necessary to perform assigned job functions.

Criteria

- 1.³ Selection criteria for operators exist and are established based on job requirements.
2. Initial training for nuclear facility process operators consists of classroom and on-the-job training, as appropriate, to the requirements of the job covering:
 - **Radiological Safety and Control** - radiation hazards, monitoring, safety practices, control procedures, and terminology.
 - **Criticality** - criticality safety principles and control procedures.
 - **Chemical Safety and Control** - chemical safety principles and controls specific to the chemical operations being performed.
 - **Facility Operating Characteristics** - principal features, operating parameters, and operations safety requirements of the facility, including the auxiliary systems.
 - **Principles of Nuclear Facility Operation** - the process and technical terminology for the chemical, physical, and metallurgical reactions.
 - **Safety and Emergency Systems** - the type of equipment, operating characteristics and procedures, and testing requirements of safety systems.
 - **Instrumentation and Control** - types of instruments and control systems, including principles of operation and consequences of malfunctions.
3. Initial training for nuclear process facility supervisors includes, in addition to the above, the following topics as appropriate to job requirements:
 - design, control, and operating limitations for the facility, including instrumentation characteristics, adjustment, operation, and facility console control mechanisms, and control-room manipulations;
 - procedures for making design and operating changes, including changes in operating procedures;
 - nuclear and radiation theory, including details of fission process, neutron multiplication, source effects, and neutron poison effects; and
 - procedures, equipment, and facilities available for handling and disposing of radioactive materials, liquids, and equipment.
- 4.¹ On-the-job training programs are structured and include appropriate performance measures.

³Procedures - normal and abnormal operating procedures, emergency actions, alarms, administrative controls, and employee responsibilities.

- 5.¹ The certification examinations are sufficiently comprehensive to verify that the trainee can properly perform his assigned duties. The minimum acceptable grade is specified in a certification policy statement.
- 6.¹ Retraining and recertification are up to date, and individuals who fail a recertification examination are prohibited from performing their normal duties until they successfully meet the recertification requirements.
7. Continuing training maintains and improves job-related knowledge and skills in areas such as the following:
 - system and component changes,
 - procedure changes,
 - industry and in-house operating experience, and
 - selected items from initial training program with emphasis on seldom-used knowledge and skills.
- 8.¹ Recertification on abnormal operating procedures and emergency response is performed annually by means of written and oral examinations. All other requirements of DOE Order 5480.5 (Draft) are recertified biennially using written, oral, and demonstration examinations.

TC.3 PERSONNEL PROTECTION

Performance Objective

The personnel protection training programs shall develop and improve the knowledge and skills necessary for facility personnel to perform their assigned job functions, while minimizing the exposure of individuals to radiation and chemicals as to low as reasonably achievable (ALARA) levels. Facility personnel includes those people working or residing in a radiochemical facility or building.

Criteria

- 1.¹ Initial training for facility residents and operating personnel includes classroom and on-the-job instruction to develop job-related knowledge and practical abilities related to occupational safety, industrial hygiene concerns, and radiation, including use of radiological survey equipment if it is expected to be necessary in the individual's job.
2. On-the-job qualification requirements are completed prior to assignment to the associated tasks.
- 3.¹ Continuing training maintains and improves job-related knowledge and practical awareness and includes:
 - equipment, procedure, and configuration changes;
 - contractor operating experience; and
 - reinforcement of seldom-used knowledge and skills.
4. Personnel protection training is provided to general employees, subcontractors, and visitors commensurate with the activities involved.

5. Maintenance personnel receive sufficient personnel protection training to recognize the hazards and to respect the limitations and precautions required for work in the facility.
6. Up-to-date training records on individuals are maintained.

TC.4 MAINTENANCE PERSONNEL

Performance Objective

The training and qualification/certification programs for maintenance personnel shall develop and improve the knowledge and skills necessary to perform assigned job functions.

Criteria

- 1.¹ All maintenance operations are performed by personnel who are properly trained in their respective disciplines.
- 2.¹ The training requirements are determined by the type of maintenance that the personnel is to perform, the degree of supervision required, and the required knowledge of the facility.
3. Training includes the safety aspects associated with the performance of each task.
- 4.¹ Maintenance procedures specify the equipment or systems that require special maintenance training. Training records indicate the personnel who are qualified for this work.
5. Maintenance workers are provided appropriate training in recognizing and respecting the need for the precautions required by work permits.
6. On-the-job training is incorporated into the overall requirements.
7. Continuing training maintains and improves job-related knowledge and skills.
8. Qualification standards and evaluation methods are adequate to verify trainee competence.
9. Maintenance supervisors are adequately informed about facilities in which they will be performing supervisory duties.
10. Up-to-date training records are maintained.

TC.5 CRITICALITY SAFETY

Performance Objective

Personnel shall receive training in nuclear criticality safety consistent with their assigned tasks.

Criteria

- 1.¹ All personnel working in the facility are trained in criticality accident evacuation emergency procedures.

- 2.¹ Personnel handling fissile material are trained in criticality safety principles and control procedures appropriate to their assigned tasks.
3. Annual evacuation drills are conducted, documented, and critiqued.

TC.6 TRAINING FACILITIES AND EQUIPMENT

Performance Objective

The training facilities, equipment, and materials shall effectively support training activities.

Criteria

1. The classroom facilities are adequate for effective group instruction.
2. Reference materials are adequate and readily accessible.
3. Equipment is available, as needed, to support training material development.
4. Training aids are adequate to support hands-on and practical demonstration training.
5. Training materials effectively support the training programs.
6. During laboratory or shop training, conditions of task performance, tools, and equipment reflect the actual job to the extent possible.

TC.7 QUALITY CONTROL INSPECTOR AND NONDESTRUCTIVE EXAMINATION TECHNICIAN

Performance Objective

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

Criteria

1. Programs are established and implemented for initial and continuing training.
2. Training develops necessary job-related knowledge and skills to ensure competence in the following areas:
 - facility-specific work control procedures;
 - applicable codes, standards, and regulations;
 - quality assurance and quality control fundamentals;
 - inspection/examination equipment and procedures;
 - job-specific inspection/examination techniques; and
 - practical factor demonstration.
3. On-the-job training is incorporated into the overall requirements.
4. Continuing training maintains and improves job-related knowledge and skills in areas such as the following:
 - inspection/examination equipment, technique, and procedure changes;

- applicable code, standard, and regulation changes;
 - industrial and in-house experience information; and
 - selected topics to reinforce seldom-used knowledge and skills.
5. Qualification standard and evaluation methods are adequate to verify trainee competence.

AUXILIARY SYSTEMS

Policy

The Chemical Technology Division (Chem Tech) will operate its R&D projects and supporting activities in a manner which minimizes the volume and contaminant content of solid, liquid, and gaseous waste streams. All wastes discharged to ORNL waste systems or to the environment will meet discharge criteria. Fissile material will be handled to minimize the chance for loss and inadvertent criticality. All vital support systems (ventilation, emergency power, electricity, water, etc.) shall be identified in SARs and OSRs, and regular checks and programmed maintenance systems shall be developed to ensure functionality and availability of the systems.

AX.1 EFFLUENT HOLDUP AND TREATMENT

Performance Objective

Effluent holdup and treatment shall ensure that the amounts of hazardous substances released to the environment meet DOE and EPA standards.

Criteria

1. R&D projects and supporting activities are evaluated to minimize the generation of radioactive liquid and gaseous wastes. Liquid tank levels and waste gas treatment systems are monitored periodically to detect unexpected changes.
2. Valuable radioactive materials in liquid waste are recovered and reused to the maximum extent practicable. Waste streams [contaminated liquids, slightly and potentially contaminated (process) liquids, and noncontaminated liquids] are segregated during collection according to the treatment required for each waste stream.
3. Methods are in use that promptly detect leaks. Action limits are used to control releases.
4. Personnel who generate, treat, and package wastes are knowledgeable of the operations they are required to perform, the ORNL waste systems, and the interface with ORNL waste management groups.
5. Operating personnel understand the hazards of waste releases and the levels at which effluent can be safely released.
6. Operating procedures exist and are employed.
7. Operating limits are listed, and records are maintained. Procedures effectively keep the volume to a minimum.
8. Nonradioactive systems that have the potential to become contaminated are monitored by installed radiation detectors or are periodically sampled and analyzed.
9. Nonradioactive liquid discharges into radioactive waste systems are minimized.

10. The total curie content and the volume of effluent from R&D projects and supporting activities are accurately determined and recorded; trends are determined and evaluated.
11. Instruments that measure radioactivity in all final effluent discharge paths operate properly and have sufficiently low backgrounds to make useful readings. Auditable records of readings are maintained.
12. Monitoring systems provide adequate operating information and warning against malfunctions or unplanned releases, including leaks.
13. Goals, based on past results and expected future operations, are established to reduce the total hazardous substances generated during operations.
14. A periodic review of radioactive effluent records is performed to determine trends.
15. The program is routinely (at least annually) evaluated, and necessary improvement actions are initiated.

AX.2 SOLID WASTES

Performance Objective

Solid hazardous wastes shall be controlled and handled so as to minimize the volume generated; provisions shall be made for safe storage and transportation.

Criteria

1. Procedures for the handling, storage, and transportation of hazardous wastes exist and are followed.
2. Personnel are trained in hazardous, solid waste handling procedures and safety precautions.
3. Procedures and training emphasize the importance of keeping the volume of solid hazardous waste to a minimum.
4. Materials are not taken unnecessarily into radiologically controlled areas.
5. The practices for utilizing protective clothing help to minimize solid radioactive waste.
6. R&D projects and supporting activities are evaluated to minimize the amount of solid radioactive waste generated and to segregate contaminated and non-contaminated waste streams.
7. Controls limit the materials taken into areas where they may become contaminated and thus increase the volume of hazardous waste.
8. Procedures for using, cleaning, and reusing protective clothing minimize the hazardous waste volume.
9. Management monitors operations that generate hazardous waste in order to reduce the volume generated.
10. Hazardous waste is stored in a manner which minimizes exposure of personnel, precludes deterioration of containers, and prevents the spread of contamination.

11. Personnel involved in transfer, packaging, and transportation of radioactive and other hazardous wastes are trained in the applicable regulations and procedures and in emergencies that might be encountered.

AX.3 STORAGE AND HANDLING OF FISSILE MATERIAL

Performance Objective

Fissile material shall be stored and handled in a manner which prevents inadvertent criticality and minimizes the chances of loss, contamination, or release of fissile material.

Criteria

1. Personnel handling fissile material are knowledgeable (as required by DOE Order 5480.5, Section 10) in:
 - use of fissile material handling, storage, shipping, and accountability procedures;
 - radiological safety and control practices;
 - use of safety and emergency equipment;
 - instrumentation pertaining to fissile material safety; and
 - emergency procedures.
2. Fissile material is stored only in approved areas and/or containment facilities and buildings.
3. Unirradiated fissionable material is stored in accordance with the requirements of DOE Order 5480.5, Section 13.
4. The Operational Safety Requirements specify appropriate bounding conditions and tests to ensure safe operation.

AX.4 VENTILATION SYSTEMS

Performance Objective

Ventilation systems shall reliably direct all airborne effluents from contaminated or potentially contaminated zones through cleanup systems to ensure that the effluent meets the criteria for discharge to the ORNL ventilation systems or to the environment.

Criteria

1. Ventilation system flows are balanced and differential pressures maintained so that air flow is from clean to less clean areas.
2. Ventilation filters and cleanup systems are maintained in good condition through regular checks of programmed maintenance.
3. Air intake systems are maintained in good condition through regular checks.
4. Pressure drop measurements detect incipient clogging of filters and dehumidifiers.

5. Charcoal adsorbers are regularly tested with radioiodine or other methods to ensure high efficiency.
6. HEPA filters are regularly checked in accordance with ANSI N510-1980.
7. Backup fans are available to provide ventilation in the event of failure of primary fans.
8. Emergency procedures are provided to put equipment, containment facilities, or buildings in safe condition and to minimize leakage from contaminated zones if any ventilation system fails.
9. Where possible, highly contaminated zones have separate ventilation systems from less contaminated zones.
10. Emergency power sources are appropriate; they are maintained and tested regularly.
11. The Operational Safety Requirements specify appropriate bounding conditions and tests to ensure safe operation.
12. All tests and measurements required by the Operational Safety Requirements are made as required.

AX.5 VITAL SUPPLY SYSTEMS

Performance Objective

The air, water, and normal and emergency power systems shall reliably provide vital services needed by the facility.

Criteria

1. Personnel are trained in the configuration and operation of the utility systems and in emergency actions required in the event of an outage.
2. Monitoring systems provide the operators with immediate warning of a system shutdown.
3. A preventive maintenance program ensures the reliability of valves, transformers, monitoring devices, etc., related to vital services.
4. Operators are skilled at bringing backup supply systems on line when primary sources fail.
5. The functionality of emergency electric power systems is tested regularly in accordance with procedures. All additional tests and measurements stipulated by the Operational Safety Requirements are made.
6. The Operational Safety Requirements specify appropriate bounding conditions and tests to ensure safe operations.

AX.6 ENGINEERED SAFETY SYSTEMS AND CRITICAL DESIGN FEATURES

Performance Objective

Engineered safety systems and critical design features shall be reliable and available to provide protection to the equipment, containment facilities, and buildings.

Criteria

1. Procedures clearly define the checks and precautions necessary to guarantee availability of safety systems and critical design features.
2. Critical systems are periodically checked for performance, and records of the results are maintained.
3. Monitoring and tests are provided to give warning of pending failure of continuously operating systems.
4. Both the Operational Safety Requirements and the Procedures specify the appropriate minimum available engineered safety-related system components and monitoring devices which are necessary to allow continued operation. Actions to be taken in the event these minimums are not met are identified.
5. Preventive maintenance on engineered safety systems and critical design features is in place.
6. All tests and measurements required by the Operational Safety Requirements are made.

EMERGENCY READINESS

Policy

The Chemical Technology Division will be prepared to respond to and mitigate any emergency in its facilities in conjunction with and coordinated with the ORNL emergency response function.

ER.1 ORGANIZATION AND ADMINISTRATION

Performance Objective

Emergency preparedness organization and administration shall ensure effective planning for, and implementation and control of, facility emergency response.

Criteria

1. The emergency organization, including interfaces with ORNL and ORO emergency personnel, is clearly defined.
2. Resources are sufficient to accomplish assigned tasks for emergency duties.
3. Individuals and their alternates are designated to perform essential emergency roles.
4. Responsibilities and authority for each person in the emergency planning and emergency response organization are clearly defined.
5. Personnel clearly understand their authority, responsibilities, and relationships within the organization and interfaces with support groups.
6. Required emergency response technical support personnel are identified.
7. Facility management will retain effective command and control of the facility during the assessment, mitigation, and recovery phases of an accident.
8. Selection of emergency operating organization personnel is based on the following:
 - the similarity of their emergency response duties to their normal day-to-day responsibilities, and
 - their ability to evaluate situations and determine appropriate remedial actions.
9. Responsibility is assigned for coordination of facility and site emergency response planning maintenance preparedness.
10. Timely and effective action is taken to track and correct identified emergency response deficiencies and their basic causes.

ER.2 FACILITY EMERGENCY PLAN

Performance Objective

The emergency plan and its supporting documents shall provide for effective response to abnormal conditions.

Criteria

1. Review, approval, and revision of the emergency plan are controlled.
2. The emergency plan is based on site-specific technical analysis of potential facility abnormal conditions, such as those presented in the Safety Analysis Report, and covers the range of credible abnormalities.
3. The emergency plan keys to the area or site emergency plan and is developed in accordance with the requirements of DOE Orders N5500.2 and 5500.3.
4. The emergency plan is concise and usable, and it includes the following elements:
 - emergency classification, as appropriate;
 - notification process (including normal and alternative means of communication);
 - composition and responsibilities of the emergency organization;
 - emergency assessment;
 - protective actions (including shutdown to a safe condition, controlling access, etc.);
 - personnel evacuation and accountability;
 - access control over evacuated areas;
 - agreements with facility emergency support organizations; and
 - reentry and recovery process.
5. The detailed actions required to carry out the emergency plan are specified in implementing procedures. Such procedures are consistent with and, where appropriate, cross-referenced with the emergency plan and other documents.
6. The emergency plan and implementing procedures are periodically updated or verified.
7. A review independent of facility management of the emergency plan and implementing procedures is conducted periodically.
8. Emergency response plans of supporting organizations are reviewed and updated as required.
9. Feedback from evaluations, appraisals, and simulated drills and exercises (or actual emergencies in DOE and the industry) is evaluated and utilized to improve emergency plan effectiveness.
10. There is a distribution and control system which ensures that all copies of the plan and the implementing procedures are kept current.

ER.3 EMERGENCY RESPONSE TRAINING

Performance Objective

Emergency response training shall develop and maintain the knowledge and skills for emergency personnel to respond to and control an emergency effectively.

Criteria

1. Programs are established and implemented for initial training, exercises, drills, and continuing training of facility and support emergency personnel and alternates. These programs include training methods, evaluation standards, and implementation responsibilities.
2. Initial training develops emergency task-related knowledge and skills and includes the following areas:
 - emergency plan;
 - emergency plan implementing procedures;
 - abnormal operating procedures;
 - normal operating procedures used in an emergency;
 - emergency facilities, equipment, and systems;
 - communications; and
 - special precautions and limitations.
3. Continuing training maintains and improves emergency task-related knowledge and skills and includes items such as the following:
 - a review of the items listed in (2) above;
 - DOE and industry emergency operating experience, as appropriate; and
 - changes in emergency operating policies, plans, and procedures.
4. Exercises and drills to improve emergency task-related knowledge and skills include the following:
 - postulated accidents of both large and small consequences,
 - exercise or drill plans that have stated objectives and criteria,
 - a realistic scenario that adequately tests emergency equipment and resources,
 - participation by key emergency organization personnel and appropriate support groups, and
 - timely critiques that include a follow-up plan for correcting identified weaknesses and improving training effectiveness.
5. Exercises and drills are conducted with sufficient content and frequency to maintain personnel proficiency.
6. The knowledge and capabilities of all emergency personnel are evaluated during initial training and at least annually thereafter. Adequate training records are maintained for each individual.
7. The effectiveness of the emergency preparedness training program is periodically evaluated, and the results are used to make program improvements.

ER.4 EMERGENCY FACILITIES, EQUIPMENT, AND RESOURCES

Performance Objective

Emergency facilities, equipment, and resources shall adequately support facility emergency operations.

Criteria

1. Facilities, including an Emergency Operations Center, of adequate size and appropriate location are designated, equipped, and ready for emergency response use.
2. Adequate backup facilities are available as required by the emergency plan and supporting documents.
3. Sufficient reliable communications channels are available to accommodate emergency needs.
4. Equipment and supplies necessary to support emergency response activities are sufficient, properly marked, and readily accessible during accident conditions.
5. Emergency equipment is inventoried, tested, and serviced on a periodic basis to ensure accountability and reliability. Included is equipment for:
 - supporting the performance of a timely accident assessment;
 - emergency dosimetry;
 - monitoring personnel, the facility, and the facility environs for all hazardous substances (radiological and nonradiological) present at the facility;
 - emergency meteorological evaluations;
 - emergency power and water supplies;
 - transporting of personnel; and
 - handling radioactivity or chemically contaminated personnel.
6. Engineering material, as appropriate, such as as-built drawings and procedures are readily available in the Emergency Operations Center and are current.

ER.5 EMERGENCY ASSESSMENT AND NOTIFICATION

Performance Objective

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

Criteria

1. Classification of emergency events is consistent with current DOE requirements.
2. Notification procedures minimize distraction of operating personnel and include, as appropriate, concise, preformatted messages.
3. Procedures for assessing a radiological emergency include methods for measuring radiation levels in the environment, measuring the release rates, and determining the source term and the projected dose for potential releases.

4. Information on the nature and magnitude of the hazards is made available to appropriate emergency personnel.
5. Protective action guides are available and used by appropriate personnel.
6. Records or logs are kept to enable review and reconstruction of actions taken during an emergency event.

ER.6 PERSONNEL PROTECTION

Performance Objective

Personnel protection procedures shall control and minimize personnel exposure to hazards during abnormalities, ensure that exposures are accurately determined and recorded, and ensure proper medical support.

Criteria

1. Individual exposure limits (radiation and chemical) conforming to DOE Order 5480.1A, Chapters X and XI, 4.1, are established for emergencies such as saving a life or protecting vital equipment. Procedures designate those individuals who can authorize the use of these limits.
2. Sufficient quantities of calibrated instruments are available to measure expected exposure rates (radiological and nonradiological).
3. Arrangements are made for providing and processing appropriate dosimetry devices for the emergency conditions.
4. Procedures and training are provided, as appropriate, for the determination of radioiodine concentration in contaminated areas, and a policy is established for thyroid-blocking agents.
5. Prearranged plans and agreements provide for transportation and medical treatment of injured and contaminated personnel.
6. Emergency limits are established for decontamination of personnel, equipment, and facilities.
7. First aid and decontamination supplies, procedures, and facilities are readily available.
8. Sufficient respiratory equipment and supplies are available. A backup method for recharging air bottles is available. The responsibility for maintaining and repairing respiratory equipment is established.
9. An effective system for personnel accountability is in place.
10. Evacuation routes are clearly marked and kept free of obstacles.

TECHNICAL SUPPORT

Policy

The Chemical Technology Division (Chem Tech) utilizes technical support services to ensure that equipment and facilities are operated in a safe, reliable, and effective manner. The Instrumentation and Control (I&C) and Plant and Equipment (P&E) Divisions at ORNL and comparable divisions at other Oak Ridge sites will work closely with the Chem Tech to accomplish this.

TS.1 FACILITY MODIFICATIONS

Performance Objective

Technical support services required by the facility to execute modifications shall be carried out in accordance with sound engineering principles.

Criteria

1. Appropriate technical specialties (e.g., criticality safety, machine shop, design engineering, process engineering, speciality testing, packaging and transportation of hazardous materials, and instrument and electrical specialties) are available and effective.
2. Approved procedures and qualified personnel are used to design, review, and implement permanent and temporary facility modifications.
3. Activities related to modifications, including design, procurement, installation, testing, and closeout, are effectively coordinated among responsible groups and controlled by the designated Chem Tech facility staff.
4. Documented design changes (e.g., drawings and procedures) receive an effective review for operability and maintainability, with input from appropriate facility personnel who are cognizant of the effect of modifications prior to operating and maintaining modified systems. The bases for such interdisciplinary review and subsequent documentation are delineated in the formal documents that are concerned with the requirements for performing and documenting the technical review.
5. All modification requests are reviewed by facility management for inclusion in the modification program. Approved requests are identified, prioritized, scheduled, and tracked. Facility management monitors the modification schedule and takes appropriate action to ensure schedule adherence.
6. Codes and standards, including those mandated by DOE Order 5480.4, Attachment 2, are addressed in designing facility modifications.
7. Requirements for installing, verifying installation, inspecting, and testing modifications are specified as part of the design process.

8. To the extent practicable, temporary modifications are controlled in the same manner as permanent modifications. As a minimum, the program shall include the following:
 - Technical and safety review are performed prior to declaring modified systems operable.
 - Temporary modifications are periodically reviewed for continued need; those needed on a permanent basis are converted to permanent modifications.
9. Final documents (as-built drawings, procedures, etc.) are completed and issued in a timely manner.
10. The effectiveness of modification programs is periodically evaluated, and the results are used to make program improvements.

TS.2 ORGANIZATION AND ADMINISTRATION

Performance Objective

Technical support organization and administration shall ensure effective implementation and control of technical support, including proper interfacing and coordination with responsible Chem Tech facility staff.

Criteria

1. The matrix organizational structure involving Chem Tech facility staff, as well as the technical support line management, is clearly defined and understood.
2. Staffing and resources for the technical support work are sufficient to effectively accomplish assigned tasks.
3. Responsibilities and authority for each management, supervisory, and professional position are clearly defined.
4. Both technical support and Chem Tech personnel clearly understand their respective authorities, responsibilities, accountabilities, and interfaces with each other.
5. Technical support supervisory personnel are knowledgeable concerning Chem Tech facility configuration operations.
6. Administrative controls are employed for activities that affect safe and reliable facility operation. Examples of such activities include additions and modifications to computer software, installation of temporary modifications, and conduct of equipment performance monitoring.
7. An employee performance appraisal program is effectively used to enhance individual performance of technical support personnel.
8. Technical support personnel are actively encouraged to develop improved methods of meeting safety, quality, and productivity goals with respect to applicable Chem Tech equipment.
9. The quality assurance organization protects the interests of facility management in activities involving procurement of equipment; shipping, handling, identification,

storage, and control of purchased items; and storage and control of materials and supplies important to safe facility operation.

TS.3 PROCEDURES AND DOCUMENTS

Performance Objective

Technical support procedures and documents shall provide appropriate direction and shall be effectively used to support safe operation of the facility. Technical support service personnel shall also follow policies, procedures, guidelines, and instructions established at the Chem Tech facilities.

Criteria

1. A complete and current safety analysis report for the facility is available for reference by technical support groups.
2. Procedures are readily available and clearly defined, and their preparation, review, approval, and revision are properly controlled.
3. Procedures manuals, and reference documents are clear, concise, technically accurate, and up-to-date; they contain adequate information for users to understand and perform their activities effectively.
 - Portions or steps of other documents that are used or referred to when performing a procedure are clearly identified in the procedure.
 - Procedures include other human factor considerations (e.g., sequenced procedure steps, use and placement of notes, and caution statements) to promote error-free performance.
4. A policy governing the use of procedures is implemented. The policy includes the following:
 - action to be taken when procedures are found to be inadequate for the intended tasks or when unexpected results occur,
 - directions for when procedures are to be used as general guidance, are to be followed step by step, or require sign-off for each step,
 - identification of procedures required to be in hand when performing the activities to which they pertain, and
 - action to be taken if procedures conflict or do not contain adequate guidance.
5. Applicable facility documents, drawings, and other technical data are available, authorized, and properly controlled.
6. Temporary changes to procedures, if used, are controlled to ensure the following:
 - appropriate review and authorization prior to use,
 - user awareness of applicable temporary changes, and
 - timely cancellation or incorporation into permanent procedures.
7. Procedures and documents require that adequate records are maintained for support services performed at the facility.

TS.4 EQUIPMENT PERFORMANCE TESTING AND MONITORING

Performance Objective

Equipment performance testing and monitoring conducted by technical support groups to ensure that operations are within safety parameters and limits shall be effective.

Criteria

1. Programs are implemented to routinely monitor, collect, trend, and analyze performance data (including thermal, hydraulic, electrical, and mechanical data) for equipment and systems specifically identified as critical to facility safety by approved procedures and qualified personnel. All testing and monitoring conducted are auditable by a third party.
2. Instrumentation used for performance monitoring is calibrated and has adequate sensitivity and accuracy to provide reliable results.
3. Optimum performance levels of critical safety equipment are defined through baseline data, design parameters, and/or modeling.
4. Performance data are analyzed, and the results are used to optimize facility reliability and efficiency (shared responsibility).
5. The effectiveness of performance monitoring programs is periodically evaluated, and the results are used to make program improvements.
6. Technical support groups perform all tests required by Technical Specifications/Operational Safety Requirements that are within their scope of responsibility.

TS.5 EVALUATION OF OPERATING EXPERIENCES

Performance Objective

Industrial and in-house operating experiences shall be evaluated by technical support analysts, and appropriate actions shall be taken to improve facility safety and reliability.

Criteria

1. A comprehensive evaluation is performed on applicable, significant industrial, and in-house operating experiences to establish appropriate corrective actions.
2. Sources of significant operating experience information that are reviewed for applicability include the following:
 - DOE and NRC letters, bulletins, and information notices
 - supplier and architect/engineer reports;
 - facility event reports; and
 - company unusual occurrence reports.
3. A continuing evaluation of the operating status of the facility is performed by experienced technical personnel, such as process analysts, chemical analysts, and

- metallurgical analysts. Corrective actions are taken as necessary and are documented.
4. Pertinent operating experience information is distributed to appropriate personnel and organizational units in a timely manner.
 5. An effective follow-up systems ensures that appropriate and timely actions are taken to achieve improvements.
 6. Technical support analysts are knowledgeable concerning the Chem Tech facility and its operation.

TS.6 ENVIRONMENTAL IMPACT

Performance Objective

Any negative impact on the environs from the operation of the facility shall be minimized.

Criteria

1. All points of potential release of hazardous material to the environment from the facility are monitored closely and documented to ensure that the types and quantities of the hazardous material released are known.
2. Responsibilities for independent monitoring of the environs of the facility are clearly defined, and resources are provided, as required, to accomplish such independent monitoring.
3. Facility management ensures that appropriate independent monitoring is being conducted.
4. Facility management has taken all reasonable efforts to minimize quantities of hazardous materials released to the environmental from facility operations.

FACILITY SAFETY REVIEW

Policy

The Chemical Technology Division (Chem Tech) will maintain an internal process to review the safety of its operations and experimental activities. This process will be responsive to guidance from the Office of Operational Safety and the Environmental and Health Protection Division to ensure a high degree of safety and compliance with the applicable DOE orders.

FR.1 SAFETY REVIEW COMMITTEES

Performance Objective

Safety committees are used to review safety questions.

Criteria

1. Safety committees exist, having been appointed by management.
2. The committees function in an advisory capacity to management.
3. Functions and authority of the safety committee are specified.
4. The Chem Tech safety committee acts as an interface between the Laboratory and the Chem Tech sections to ensure an effective safety program.
5. The section safety committee reviews experiments and consults other groups as required.
6. The expertise of the committee members varies, making the group interdisciplinary with adequate breadth to cover all safety aspects present at the experimental facility.
7. Not all of the committee members are directly involved with the operation of the facility in their normal job assignments.

FR.2 SAFETY REVIEW TOPICS

Performance Objective

Items that require review by a safety committee shall be well defined and understood by facility management.

Criteria

Safety committees will review:

- incidents and accidents involving significant safety problems and selected Unusual Occurrence Reports (UORs);
- all facility, process, equipment, or instrumentation modifications and any other changes to safety-related systems or components;
- changes to, and violations of, Operational Safety Requirements (OSRs);

- proposed experimental programs; and
- any other problem that facility management feels may have safety significance.

FR.3 OPERATION OF SAFETY COMMITTEE

Performance Objective

Review of facility activities by the safety committee shall ensure achievement of safety.

Criteria

1. The facility manager reports promptly to the Section Head and consults with the safety committee on any topic of concern.
2. After review, recommendations of the committee are submitted to management.
3. Recommendations of the safety committee are approved or disapproved by management, and those approved are sent to the facility manager for implementation.
4. The reasons for rejecting any recommendation are documented.

FR.4 ANNUAL FACILITY SAFETY REVIEW

Performance Objective

An annual operating review of the appropriate facilities shall be performed by a committee appointed by management.

Criteria

1. Areas covered by the annual review include:
 - modifications made to plant and equipment having safety significance and safety analyses thereof,
 - proposed experiments and irradiations having safety significance,
 - procedures and significant changes thereto,
 - performance of training programs,
 - adherence to nuclear criticality safety program requirements,
 - occurrences (all UORs),
 - the condition of the physical plant,
 - organization and staffing,
 - accuracy and completeness of records and documentation, and
 - critical operational and maintenance activities.
2. The committee performing the annual review may be the same as that which reviews safety questions.
3. Adequate documentation of the annual review is maintained.

FR.5 TRIENNIAL APPRAISAL OF FACILITY SAFETY REVIEW SYSTEM

Performance Objective

A triennial appraisal of the safety review system shall be performed by contractor management.

Criteria

1. A reviewer or a committee is appointed by management.
2. Records and documentation pertaining to the safety review of the facility during the past 3 years indicate that all necessary safety issues have been addressed appropriately by the review system.
3. Interviews with facility personnel indicate that the safety committee and the safety review system are effective and respected.
4. The frequency between appraisals is consistently less than 42 months.
5. Documentation of the triennial appraisal is adequate for a third-party review of the quality of content.

FR.6 PROJECT PROPOSALS

Performance Objective

A proposed experiment shall contain all information necessary for safety evaluation and approval.

Criteria

1. Personnel proposing a project have adequate background and training.
2. An information and evaluation package containing design and operating details and an analysis of the safety implications of the project is submitted to the safety committee with the proposal.
3. Equipment and instrumentation designs for large projects are reviewed at several stages so that the output from safety reviews can be incorporated into the design as it progresses.
4. The independent safety review committee may provide the R&D staff with a proposal outline to ensure that information is submitted on all applicable areas pertaining to safety.
5. The final review, based on which the safety committee decides whether to permit startup, includes complete engineering design, operating details, and procedures.
6. Any precautions or design changes recommended by the safety committee and accepted by the "approval authority" are incorporated in the design and operating procedure prior to startup.
7. All desired changes to project operating conditions which could adversely impact any safety limitations are reviewed and approved by the same process as the original proposal.
8. Documented guidelines specify the appropriate approval authorities.

NUCLEAR CRITICALITY SAFETY

Policy

The Chemical Technology Division will carry out its activities involving handling and storage of fissile materials in a manner that will ensure subcriticality.

CS.1 ORGANIZATION AND ADMINISTRATION

Performance Objective

Management of nuclear facilities in which fissionable materials are handled, processed, or stored shall organizationally address nuclear criticality safety and administer a nuclear criticality safety program meeting the requirements of DOE Order 5480.5, Section 11, and ANSI/ANS 8.1-1983 to ensure nuclear criticality safety during all activities.

Criteria

1. The nuclear criticality safety program is defined and documented.
2. The health-and-safety-type organization, which is independent from the operational organization, includes a nuclear criticality safety entity.
3. The nuclear criticality safety program includes a formal internal review and audit of conformance of operations to the program.
4. A formal documented system for the control and traceability of required records and documentation exists.
5. Nuclear accident dosimeters are employed, and their number, type, and placement are appropriate.

CS.2 USE OF NUCLEAR CRITICALITY SAFETY CONTROL PARAMETERS

Performance Objective

Nuclear criticality safety shall be achieved by controlling one or more specified parameters of the system within subcritical limits.

Criteria

1. Where applicable, reliance is placed on control by geometry rather than administrative controls, and the dimensions of equipment are limited to provide criticality safety.
2. Administrative controls, such as mass and concentration controls, used to maintain nuclear criticality safety are specified.

3. For operations depending on mass controls, where the contained volume does not automatically limit the contents to a safe mass or less, the possibility of multiple batching is considered.
4. Mass limits are determined experimentally or from calculations made by an experimentally validated method.
5. Process designs incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a nuclear criticality accident is possible.
6. Available data confirm the suitability, the presence, and the reliability of neutron absorbers, such as cadmium and boron, when they are used to provide criticality control. Care is exercised in the use of solutions of neutron absorbers to ensure their effectiveness. The requirements of ANSI/ANS 8.5-1097 are used as appropriate.
7. Neutron moderation and neutron reflection are used in all systems involving fissionable materials.
8. Safety margins meet the above criteria and include an allowance for experimental and computational uncertainties.

CS.3 NUCLEAR CRITICALITY SAFETY EVALUATION

Performance Objective

Nuclear criticality safety evaluations of the design and operation of process equipment shall ensure that criticality safety is achievable under normal and abnormal operating conditions.

Criteria

1. Before starting a new operation with fissionable material, or before changing an existing operation, a nuclear criticality safety evaluation determines that the entire process will be subcritical under both normal and credible abnormal conditions.
2. The parameters that will be controlled to ensure criticality safety are explicitly identified and their associated limits are given for each operational step.
3. The nuclear criticality safety evaluations are documented with sufficient detail and clarity to allow independent review of the results.
4. Before a new procedure is started, the adequacy of the nuclear criticality safety evaluation is independently confirmed.

CS.4 OPERATING PROCEDURES AND CRITICALITY SAFETY LIMITS

Performance Objective

The approved written operating procedures shall address criticality safety limits in providing effective guidance for all aspects of facility activities.

Criteria

1. Procedures include criticality safety limits and controls significant to the safety of the operations defined by the procedures.
2. When criticality safety limits for an operations are changed, the procedures are changed to reflect the changed criticality safety limits before additional operations are allowed.
3. Nuclear criticality safety limits are posted at work locations to assist personnel in being constantly aware of the limits.
4. Nuclear criticality safety limits are posted in conspicuous places near fissionable materials storage areas.
5. New or revised procedures are reviewed from a criticality safety perspective, and any changes impacting nuclear criticality safety are reviewed and approved by the nuclear criticality safety staff.
6. Procedures require the reporting and investigation of occurrences involving criticality safety limits in conformance with DOE Orders 5484.1 and 5000.3.

CS.5 CRITICALITY ALARM SYSTEM AND EMERGENCY PROCEDURESPerformance Objective

An alarm shall exist which will immediately detect a criticality accident and will automatically alarm with sufficient volume and coverage to be heard in all areas that must be evacuated.

Criteria

1. The criticality alarm systems are installed in all locations wherein the quantities of fissionable material may exceed: 700 g of ^{235}U ; 520 g of ^{233}U , 450 g of ^{239}Pu , or 450 g of any combination of these three nuclides; also, 200 g of ^{241}Pu , 13 g of ^{242}Am , 90 g of ^{243}Cm , 30 g of ^{245}Cm , 900 g of ^{247}Cm , 10 g of ^{249}Cf , and 5 g of ^{251}Cf .
2. The alarm system is clearly audible in all areas that must be evacuated.
3. The detectors are capable of detecting a criticality conditions that produces an absorbed dose in free air of 20 rads of combined neutron plus gamma radiation at an unshielded distance of 2 m from the fissionable material within 60 s.
4. Provisions are made to minimize false alarms. These provisions may include concurrent response of two or more detectors or single, highly reliable detectors to initiate the alarm. In redundant systems, failure of a single channel shall be in a fail-safe mode.
5. Instrument response is tested and calibrated on a defined schedule. Records of the tests and calibrations are maintained.
6. Criticality alarm systems conform to the requirements of ANSI/ANS 8.3-1979.
7. The entire system is tested on a defined schedule. Each audible signal generator is tested at least once every 3 months.
8. Evacuation routes are designated and identified.

9. Prearrangements are made for the medical care and treatment of injured, exposed, and possibly contaminated personnel.
10. Radiation monitoring instruments and procedures are provided for determining the radiation in the evacuated area following a criticality accident.

RADIOLOGICAL PROTECTION

Policy

The Chemical Technology Division (Chem Tech) will operate its R&D projects, its supporting activities, and its buildings and facilities in a manner that meets or exceeds the requirements of the regulations and policies for radiation protection and which actively promotes the ALARA principle of radiation protection of our personnel, our facilities, the public, and the environment.

RP.1 ORGANIZATION AND ADMINISTRATION

Performance Objective

The Chem Tech organization and administration ensures effective implementation and control of radiological protection activities within its facilities.

Criteria

1. Organizational responsibilities for radiological protection are clearly defined.
2. Personnel clearly understand their authority, responsibilities, and accountabilities.
3. Radiological protection requirements are implemented by management in accordance with approved, up-to-date policies and procedures.
4. Adequate staffing and resources are provided for assigned tasks.
5. Management has a proactive program for attaining ALARA goals in radiation protection by training, by promoting safe work practices, by reviewing and analyzing radiation exposures, by correcting deficiencies, by actively encouraging staff participation in attaining ALARA goals, and by actively working to reduce the opportunities for the release of radioactive materials to the environment.
6. There is a clear understanding of the duties and responsibilities of radiation protection support personnel provided by the Environmental and Health Protection Division to work in Chem Tech buildings or facilities.
7. There is a clear understanding of the duties and responsibilities of both Chem Tech and non-Chem Tech personnel for the radiation protection of non-Chem Tech personnel assigned to or working in Chem Tech buildings or facilities.

RP.2 INTERNAL AUDITS AND INVESTIGATIONS

Performance Objective

The effectiveness of the Chem Tech radiation protection program is measured by periodic internal audits. Any accidents, incidents, unusual occurrences, or failures to measure up to the performance objectives or criteria are investigated, documented, and analyzed; where indicated, corrective actions are taken to prevent repetitions.

Criteria

Internal Audits for Routine Operations

1. Radiation Protection program elements are audited internally at specified intervals (not to exceed 3 years) by qualified personnel not directly connected with the operations under review to determine the effectiveness of the program for detecting problems and providing corrective actions.
2. The audits are documented and circulated to inform and increase the awareness of the division staff to the issues of radiation protection within Chem Tech.
3. Chem Tech management is aware of the findings and recommendations from the internal audits and ensures appropriate follow-up action.

Accidents/Incidents/Unusual Occurrences

1. The actions required to identify, evaluate, report, document, and follow up any indicated corrective actions for each event in these categories are clearly described.
2. The investigation and reporting of accidents and unusual occurrences are governed by procedures and policies.
3. The events are categorized by type of event, frequency, causes, and trends for planning and implementing corrective actions, where indicated.
4. Chem Tech management actively oversees the post-event activities and corrective actions.
5. Chem Tech management stops work, if necessary, to ensure that any corrective action is taken to preclude repetition or broadening of the accident.

RP.3 RADIOLOGICAL PROTECTION PROCEDURES AND POSTING

Performance Objective

Procedures for the control and use of radioactive materials and radiation generating devices provide for safe operations and clearly identify areas of potential hazard.

Criteria

1. Chem Tech policies for radiation protection are traceable to DOE orders [i.e., from DOE orders to Martin Marietta Energy Systems, Inc. (Energy Systems) policies and procedures to ORNL Standard Practice Procedures to Chem Tech policies and procedures.]

2. Energy Systems has a written policy on radiation protection, including ALARA.
3. Radiation protection standards, procedures, and controls have recognizable or formal technical bases for limits, methods, and personnel protection standards. They include sound radiological requirements such as those recommended in American National Standards Institute (ANSI) and National Council on Radiation Protection and Measurements (NCRP) documents.
4. Work in radiation areas is performed using approved operating procedures. Radiation Work Permits (RWP) are used as specified in the Health Physics (HP) Manual for ORNL. The supervisor may require an RWP as his option.
5. The radiation protection procedures are adequately documented, reviewed, and up to date.
6. Important safety documentation (e.g., Problem Safety Summaries, Safety Analysis Reports, Operating Safety Requirements, and Safety Analyses) have a documented approval chain, are scheduled for review and/or revision at specified intervals, and are maintained at the site and in a centralized, historical file. There is a tracking and inventory system to ensure that the review/revisions are performed on time and that the records are retained as specified by procedures.

Posting

Posting in Chem Tech facilities is the responsibility of Chem Tech staff members and shall be addressed by them in consultation with EHPD staff.

1. The technical criteria and dose rate and/or levels for defining radiation, high radiation, very high radiation, contamination, and airborne radioactivity areas are established, documented, and consistently applied.
2. Radiation levels are established and documented for situation where areas are to be barricaded and marked to prevent inadvertent entry and where areas are to be physically locked to preclude unauthorized entries.
3. Current radiation work permits (radiation-zone entry permits) or posted regulations meeting the requirements of the facility are posted at entrances to work areas as required. They reflect actual working conditions. Out-of-date work permits are removed in a timely manner.
4. Results of radiation surveys of radiation areas are posted at the entrance [Environmental and Health Protection Division (EHPD)].
5. Airborne activity areas are posted to alert personnel to possible respiratory protection requirements.
6. DOE required forms are posted in all facilities (i.e., DOE.F.5480.2) (?)
7. Areas where radioactive materials are handled or stored are clearly and accurately posted.
8. Entrance to areas where radioactive materials are used or stored is restricted based on established criteria.

Source Control

1. Inventories of stored radioactive materials specify locations, quantities, and characteristics; they are current and periodically audited.
2. Procedures are in place to adequately control, label, handle, ship, and receive source material. They do address ALARA principles.
3. Containers used for storage provide at least one barrier of containment.

Radiation Generating Devices

1. The radiation field around radiation-generating devices and radioactive material has been characterized; appropriate procedures and warning signs are utilized.
2. Fail-safe interlocks, barriers, shielding, visible warning lights, and area radiation monitors are required to ensure the safety of operators and other personnel.
3. Setpoints to activate interlocks and alarms (visible and audible) are documented and tested.
4. Inspections of machines are performed periodically and documented.

RP.4 EXTERNAL RADIATION EXPOSURE CONTROL PROGRAM**Performance Objective**

External radiation exposure controls shall minimize personnel radiation exposure.

Criteria

1. Effective exposure control methods are used in accordance with ALARA principles.
2. The radiation exposure reduction program includes work planning and scheduling when significant personnel exposure is expected.
3. Specific job-related exposure reduction efforts (i.e., temporary or permanent shielding, special tools, decontamination, personnel briefings, and training) are incorporated into work procedures where appropriate.

PERSONNEL PROTECTION

Policy

The Chemical Technology Division will operate its R&D projects, its supporting activities, buildings, and facilities in a manner that meets or exceeds policies for chemical, physical, and biological hazards.

PP.1 CHEMICAL CONTAMINATION

Performance Objective

Chemicals shall be controlled so as to minimize contamination of areas, equipment, and personnel.

Criteria

1. Process, operating, mechanical, and/or administrative controls have been implemented to ensure that employees are not exposed to unacceptable levels of chemicals in the work place.
2. Proposed new or modified chemicals, processes, and operations are examined to determine the need for controls to prevent potential health risks.
3. Periodic inspection and maintenance programs are established for all mechanical/engineered contaminant control systems if they exist.
4. Operator and supervisory training programs include instruction in the proper use, maintenance, and performance of chemical control systems and procedures if they exist.
5. Monitoring data are regularly obtained, as needed, for potential contaminants, and the information is utilized in determining the effectiveness of control measures.
6. Housekeeping practices and programs reflect a commitment to minimize contamination of areas, equipment, and/or personnel.

PP.2 HAZARD COMMUNICATION

Performance Objective

Facility personnel shall be adequately informed of chemical, physical, and biological stresses they may encounter in their work environment.

Criteria

1. There is a program for communicating to all persons in the facility a knowledge of the hygienic hazards present.
2. All hazardous chemicals are appropriately labeled.
3. Material safety data sheets are readily available for all hazardous chemicals.
4. Personnel are alerted to potential stress and unhealthful environments by postings.

5. Employees and supervisors are informed of the resources available to obtain information on potential hazards they may encounter in their work environment.
6. Written notification is provided when monitoring results indicate that the employee's exposure exceeds permissible limits.

PP.3 OCCUPATIONAL SAFETY

Performance Objective

All workplaces of the facility shall be as free as possible from occupational safety hazards so that employees are effectively protected against accidental death or injury.

Criteria

1. Safe work practices and procedures have been developed.
2. Employees are required to adhere to safety rules.
3. Inspections and reviews of the facility are conducted to discover occupational safety deficiencies and to evaluate compliance with the Occupational Safety and Health Act (OSHA) standards.
4. There is a formal notification system for reporting occupational safety hazards, injuries, accidents, and complaints.
5. Accident investigations are conducted of incidents and events that result in injuries or death.
6. There is an employee suggestion system to provide feedback to management to solve occupational safety problems.
7. Work orders and work permits are reviewed for potential occupational safety impacts.
8. Equipment at the facility is appropriately labeled and marked with safety warnings, clearances from obstructions, and instructions for emergency actions.
9. The facility is clean, uncluttered, and free of tripping and slipping hazards.
10. Ladders and other climbing equipment meet OSHA standards.
11. Machine guarding is available and in place for machines with moving and rotating parts that may present work place hazards.
12. There are tagout and lockout procedures to prevent accidental contact of workers with energized circuits and other significant hazards.
13. Proper personal protective equipment is provided and utilized.
14. There is an effective abatement program to correct identified OSHA deficiencies at the facility.
15. Emergency escape routes are provided and identified.
16. There is a preventive maintenance program for powered platforms, hoisting and rigging devices, and other powered tools and machinery.
17. Pressurized systems are reviewed annually for safety.
18. There is an occupational safety and health training program for all employees.
19. Occupational safety statistics, OSHA information, and employee occupational safety rights and obligations are visibly posted.
20. Safety reminders are posted locally (i.e., "fire door - keep closed at all times").

FIRE PROTECTION

Policy

In supporting the Oak Ridge National Laboratory's goal of providing a safe workplace for its employees and protecting the public health, the Chemical Technology Division (Chem Tech) will administer a fire prevention and control program that will achieve the lowest reasonable risk of personal injury, insult to the environment, and loss of property.

FP.1 FIRE PROTECTION

Performance Objective

Chem Tech's Fire Protection Program will be in compliance with DOE Order 5480.7, Fire Protection; ESH-21, Fire Protection Program; and ORNL SPP X-LP-5, Fire Protection and Control.

Criteria

1. Security considerations will not jeopardize safety provisions.
2. Materials posing a threat to the environment are limited to the extent that a credible release from a postulated fire does not exceed guidelines. Our automatic fire protection features, including containment and ventilation protection systems, are sufficient to preclude an off-site release greater than prescribed by guidelines in the event of a postulated fire.
3. Inspection, supervision/alarm, and maintenance procedures are sufficient to minimize the chance that the protection systems required by criterion 2, above, are not impaired.
4. An adequate emergency organization exists to initiate control and limitation measures in the event of fire release of hazardous materials.
5. Deviations from the basic objectives are described in headquarters-granted exemptions or are to be corrected by approved corrective action projects.
- 6.⁴ The facility is included in the independent fire protection survey program provided under contract to the HQ Office of Operational Safety.
7. There is a corrective action plan to accomplish the recommendations submitted under the independent survey program, and progress in completing the recommendations from previous surveys is acceptable and documented.
8. A Safety Analysis Report, Fire Hazards Analysis, Maximum Credible Loss Analysis, or similar document has been prepared to evaluate the maximum downtime and maximum property losses associated with credible fire scenarios.

⁴Denotes criteria to be included in a Memorandum of Understanding (MOU) from the Fire Department.

- 9.⁴ A documented inspection program exists for all items of fire protection equipment.
10. A documented self-appraisal program exists for each facility, its equipment and processes; it is updated not less than annually.
11. A training program exists for facility employees assigned fire protection functions.
12. A documented fire protection plan is in effect, including cutting and welding permits and hazardous materials controls.
- 13.⁴ An assurance program exists for maintaining the integrity of fire protection system controls through the use of locks, seals, electrical supervision, shut-off permit systems, routine inspection and tests, and recorded location/component lists.
14. All flammable liquids handling involves the use of approved safety cans, storage containers, and/or protected storage areas.
15. Portable fire extinguishers are provided where suitable, and locations are appropriately marked.
16. Pre-fire plans exist for each facility, and the fire brigade updates them and drills in their use.
17. Boiler, furnace, and oven controls are in accordance with appropriate NFPA standards to include flame failure devices.
18. Devices such as plating tanks, heaters, etc., subject to fire damage from failure or inattention to primary controls are provided with secondary temperature limit switches.
19. Combinations of watchman/guard/alarm provide continuous surveillance of important areas during normally unoccupied periods.
- 20.⁴ Water supplies are adequate for the calculated demand and are reliable.
- 21.⁴ Water supplies are included in the inspection, test, and maintenance schedules.
22. Special hazards are protected by extinguishing systems, supplementing the building protection systems.
23. Fire protection engineering input is provided to the planning and design review process.
- 24.⁴ Acceptance testing after installation or modification of fire protection equipment includes fire protection engineering expertise.

TRANSPORTATION AND PACKAGING

Policy

The Chemical Technology Division will package and transport radioactive and other hazardous materials in a manner that is consistent with existing Department of Energy (DOE), Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), Environmental Protection Agency (EPA), International Atomic Energy Agency (IAEA), International Air Transport Association (IATA), International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), Martin Marietta Energy Systems, Inc., (Energy Systems), Oak Ridge National Laboratory (ORNL), and Chemical Technology Division (Chem Tech) Orders, Regulations, and Procedures.

TP.1 MANAGEMENT POLICY AND DIRECTIVES

Performance Objective

To ensure that applicable Martin Marietta Energy Systems, Inc., (Energy Systems) Policy Procedures; Department of Energy (DOE) Orders; Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), Environmental Protection Agency (EPA), International Air Transport Association (IATA), International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), and International Atomic Energy Agency (IAEA) Standards and Regulations; and Chemical Technology Division (Chem Tech) Procedures for the packaging and transportation of hazardous materials are documented, distributed, and implemented as applicable within Chem Tech.

Criteria

1. Management directives are current and contain applicable standards and references.
2. Directives are formally implemented in a timely manner.
3. Policies and implementation procedures, including incident reporting procedures, are documented and reflect conformance with applicable standards; they are understood by persons involved in packaging and transportation. Relationships and interactions with other entities (e.g., health physics, maintenance, and quality assurance) are documented in the procedures and are understood.

TP.2 ORGANIZATION AND ADMINISTRATION

Performance Objective

To ensure that Chem Tech is organized, staffed, and managed to provide for the safe and effective packaging and transportation of radioactive and other hazardous materials.

Criteria

1. Organization clearly depicts lines of responsibility and communication.
2. Management provides strong support for adherence to safety rules.
3. Responsibilities/authorities of line supervision and staff personnel are documented for normal and emergency operating conditions.

TP.3 COMMUNICATIONS

Performance Objective

To ensure that effective communication channels are in place within the CTD to disseminate applicable DOE, EPA, NRC, IATA, ICAO, IMO, and IAEA Regulations; DOE Orders; Energy Systems Policy Procedures; and ORNL and Chem Tech Procedures.

Criteria

1. Transportation and packaging safety responsibilities and standards are communicated to all appropriate Chem Tech personnel.
2. There is adequate two-way communication, both vertically and horizontally, within Chem Tech and with other interfacing ORNL organizations.
3. There is an effective system for keeping Chem Tech management apprised of the transportation and packaging activities within the division.
4. Transportation and packaging information is effectively communicated upward by Chem Tech management.

TP.4 PROCEDURES

Performance Objective

To ensure that adequate Chem Tech transportation and packaging procedures are documented, distributed, and implemented.

Criteria

- 1.⁵ CTD procedures are consistent with Energy Systems Policies, DOE Orders, and other federal, state, and international regulations. Facility procedures adequately incorporate the operating procedures of DOE 5480.3, Section 10, which addresses packaging and transportation of hazardous materials.
2. There is a system in place to ensure that transportation and packaging requirements (internal and external to Chem Tech) are formally implemented in a timely manner.
3. There is a system in place which drives the periodic review and updating of procedures, in addition to timely updates necessitated by requirements changes.
4. There are appropriate detailed procedures in place covering the transportation and packaging of radioactive and other hazardous materials.
- 5.⁵ There is a system in place to ensure that all off-site transport of radioactive material utilizes packagings for which there exists current certificates of compliance when required.
6. Chem Tech managers, supervisors, and other personnel involved with the transportation and packaging of hazardous materials are appropriately aware of and familiar with the operating procedures.

TP.5 STAFFING AND PROFESSIONAL DEVELOPMENT

Performance Objective

To ensure that an adequate staff of qualified personnel exists to effectively carry out Chem Tech's transportation and packaging activities and to ensure that professional development opportunities are afforded Chem Tech personnel to keep them abreast of current and future regulations.

Criteria

1. Staffing is adequate in number and expertise.
2. Basic and recurrent training programs are in place and functioning as required. The time frame for retraining and/or updating is consistent with functional requirement. (Personnel are properly trained to the requirements of DOE Order 5480.3, which includes the requirements of 49 CFR 100-199 and 10 CFR 71.)
3. Available in-house ORNL and DOE-sponsored training is considered to be the primary source of training for external hazardous materials and wastes regulation compliance training, and its use is maximized.
4. Chem Tech employees who prepare shipments of fissile materials are trained in nuclear criticality safety control procedures appropriate to their jobs.
5. Training effectiveness is evaluated and documented.

⁵Addresses requirements of a DOE Order, appropriate nuclear industry lesson-learned, or appropriate NRC-licensed facility requirement.

6. Records of each individual's training participation are maintained in an auditable manner.

TP.6 INCIDENT AND ACCIDENT INVESTIGATION AND REPORTING

Performance Objective

To ensure that an effective, comprehensive, and adequate system is in place for investigating incidents and accidents to determine how responsibilities may be clarified and errors reduced.

Criteria

1. Chem Tech's investigation and reporting system complies with ORNL and DOE requirements.
2. Data obtained from this system are analyzed for trends and risk potential.
3. Incident reporting procedures are documented, and appropriate persons are designated to be notified. Responsibility for incident reporting is documented.
4. Corrective actions are tracked and followed up by appropriate Chem Tech management.

CONFIGURATION MANAGEMENT

Policy

The Chemical Technology Division at the ORNL will establish a Configuration Management and Configuration Control System for critical facilities that have been identified by code, regulation, policy or line management's choice. It will be applied to those items, components, systems, or projects (including job activities) defined as critical in that they mitigate risk of hazard or performance for a critical facility to an acceptable level. Critical systems will have complete-and-formal, operational-and-design, and change-and-as-built technical documentation, approval, and control in order to ensure safety and security and avoid environmental, development, production, or research loss of the critical facility.

CM.1 ORGANIZATION AND ADMINISTRATION

Performance Objective

The configuration management plan comprehensively controls the identification and configuration of critical facilities to ensure safe, effective, and reliable facility performance.

Criteria

1. The configuration management program provides the mechanisms for identifying critical facilities and documenting, approving, and controlling the operating and physical characteristics of critical systems defined by assessment or analysis as those mitigating risk or production or research loss in a critical facility to an acceptable level.

CM.2 CONFIGURATION IDENTIFICATION

Performance Objective

The configured items controlled as part of the configuration control system shall include all hardware, software, and operational control documents of critical systems and all routine or generic operating procedures except those excluded (documented) by line management in order to ensure safe, effective, and reliable operation and, as required, security/safeguards, as well as to avoid environmental, development, production, or research loss for critical facilities.

Criteria

1. Critical systems are identified as those systems requiring the necessary physical, functional, and performance parameters to ensure the safety, security, and effective and reliable operation of the critical facility.

2. Documentation of critical systems shall represent the design and the current as-built configuration.
3. Documentation of related computer hardware and software design and current as-built configuration shall be identified, available, and controlled.
4. Documentation of operating and maintenance procedures required for critical items shall be identified, documented and controlled.

CM.3 VERIFICATION OF EXISTING BASELINE CONFIGURATION

Performance Objective

The documented baseline configuration reflects the current status of operating and physical configuration of the critical facilities and/or items.

Criteria

1. The approved as-designed status is adequately documented.
2. The operated and as-built configuration is verifiable and adequately reflected in plant documentation.

CM.4 CHANGE CONTROL PROCESS

Performance Objective

Any proposed changes to a critical facility and/or critical system baseline are analyzed, implemented, and documented to ensure the continued safe and reliable operation.

Criteria

1. Any proposed changes to a critical facility and/or critical system baseline are properly and thoroughly analyzed, implemented, and documented to ensure the continued safe, effective, and reliable operation of the facility.
2. Changes to an approved operated and as-designed configuration are controlled.

CM.5 INTERFACE CONTROL

Performance Objective

Interface control ensures that multiple organizations comply with a facility's configuration control process and maintain compatibility between system and component interfaces.

Criteria

1. Interfaces, the functional and/or physical boundary conditions between a configuration item and another item, are identified, maintained, controlled, and documented.

2. Interface issues and requirements resulting from the interaction of multiple organizations, including contractors, vendors, etc., concerning specific project tasks are controlled and documented.

CM.6 DOCUMENT CONTROL PROCESS

Performance Objective

Document control systems shall provide correct, readily accessible, and secured information to support facility requirements.

Criteria

1. Preparation, review, approval, and distribution of controlled documents for the facility are performed according to an established procedure.
2. Configured item records, including superseded documents, are stored and indexed such that they can be readily retrieved.

Proposed Short-Term Actions to Implement Identification of Baselines within the Chemical Technology Division at ORNL

It is recommended that we provide implementation of baseline identification prior to the approval of the formal configuration management procedure. These actions also will contribute to the content of the configuration management and configuration control procedures.

1. Appoint a configuration management coordinator (CMC) to do a requirements survey of the applicable controlling standards, orders, policies, and procedures issued by DOE, Energy Systems, ORNL, Chem Tech, the Quality Division, or those found in the Code of Federal Regulations, that require the integrity or safety of any item's performance or interaction with other items of a given system or facility from inception through design and operation to closeout.
2. From the results of the requirements survey, the Section Heads and the CMC identify what facilities, systems, projects, or activities are critical.
3. After approval by upper division management, the CMC enlists the support of the Energy Systems Record Analysis and Control Department to help set up the record systems for configuration identification and to provide input for the formal configuration control procedure.

DESIGN ADEQUACY

Policy

The Chemical Technology Division will carry out its design activities in a manner that will achieve and maintain design objectives for performance and will ensure that no unacceptable safety and environmental risks occur.

DA.1 ADEQUACY OF OVERALL DESIGN WITH RESPECT TO SAFETY

Performance Objective

Design of equipment, containment facilities, and buildings does not allow unacceptable risks (consistent with ALARA concepts) to the environment or to the health and safety of the operating personnel and the public.

Criteria

1. Appropriate design safety standards are identified for use in design and design modifications. (Ref. DOE Order 5480.4)
2. Applicable design safety standards are satisfied by the design and design modifications.
3. Safety of design and design modifications is verified, including verification by independent reviews. Applicable portions of NQA-1 shall be included.
4. Design safety standards, application of design safety standards, and methods used to verify the safety of design are continually evaluated in light of improved methods and new information.

DA.2 ABILITY TO ACHIEVE DESIGN OBJECTIVES

Performance Objective

The design is adequate to ensure that the equipment, containment facilities, and buildings can be used to effectively achieve the desired functions.

Criteria

1. Objectives for the design are clearly defined and understood by the appropriate personnel (R&D project and ES&H) and designers.
2. The purposes of the project, equipment, containment facilities, and buildings are explicitly considered as part of the design and design modification process, including examination by independent reviewers.

DA.3 ABILITY OF DESIGN CONTROL PROCESS TO ENSURE MAINTENANCE OF DESIGN OBJECTIVES

Performance Objective

The design control process ensures that all design objectives are clearly recognized, evaluated, and preserved throughout the life of the project, equipment, containment facilities, and buildings.

Criteria

1. A design control process based on good engineering practices is in place.
2. The design control process is capable of verifying that design and design modifications comply with design objectives.
3. Evidence of design compliance and design evolution is documented, traceable, and retrievable.
4. The design control process includes appropriate independent reviews to ensure integrity of the process.
5. The design control process ensures that all necessary functional parts of the organization are involved in the design process.
6. Periodic reviews and evaluations are conducted to ensure that the design and design modifications meet the current standards.

QUALITY ASSURANCE

Policy

In supporting the Oak Ridge National Laboratory's goal of excellence, it is the policy of the Chemical Technology Division to maintain and utilize an effective Quality Assurance Program that will ensure reliable, efficient, and safe operation of all facilities and provide confidence of satisfactory performance. Quality shall be given equal consideration with cost and schedule in all activities.

Responsibility for the quality of all phases of work must be accepted and discharged by the line organization. All levels of line management must demonstrate a proactive commitment to the achievement of quality through implementation of an effective Quality Assurance Program.

QA.1 QUALITY ASSURANCE PROGRAM AND ORGANIZATION

Performance Objective

Management shall organize and administer the Quality Assurance Program to ensure that quality is achieved, verified, and maintained.

Criteria

1. The organizational structure is clearly defined and understood by all personnel.
2. The responsibilities and authorities of each management, supervisory, and professional position are clearly defined and understood by facility personnel.
3. The organizational structure, responsibilities and authorities are documented and controlled.
4. A documented and approved quality assurance plan that meets the requirements of DOE Order 5700.6B, ORNL Quality Assurance Manual, and program-specific requirements (such as ANSI/ASME NQA-1) is employed by each facility.
5. All personnel will be aware of their responsibility and understand their role in providing assurance of quality.

QA.2 DESIGN CONTROL

Performance Objective

Management shall define the quality assurance requirements for facilities or groups performing design services within the division to ensure that designs are satisfactory for their intended use.

Criteria

1. Applicable design inputs, such as design bases, performance requirements, regulatory requirements, codes, standards, and quality verification requirements will be specified.
2. Designs will be verified by any competent individual or group other than those who performed the original design.
3. Design activities will be documented on a timely basis and to the level of detail necessary to permit verification that the design meets requirements.
4. Design activities will be performed in accordance with documented instructions and procedures.

QA.3 PROCUREMENT CONTROLPerformance Objective

Management shall define the quality assurance activities necessary to ensure that procured items are fit for their intended use.

Criteria

1. Purchase requisitions will identify the technical requirements and designate that either routine or special inspection is needed.
2. Purchased items will conform to the procurement documents, or nonconformance reports will be generated; and nonconforming items will be segregated to await disposition/resolution.
3. For special items (or items) requiring special inspections, the Quality Assurance Specialist (QAS) or Quality Assurance Representative (QAR) will review the purchase requisition for verification that the requirements are adequate to ensure the quality of the item.
4. For the fabrication of special items, the drawings and/or technical specifications will specify the applicable quality verification requirements.
5. The quality of special items will be certified by the supplier and/or verified by a functional test.

QA.4 DOCUMENT CONTROLPerformance Objective

Management shall define the actions and responsibilities required to control documents that specify quality requirements or prescribe activities affecting quality.

Criteria

1. Document control will be consistent with documented procedures and will be responsive to sponsor or programmatic requirements.

2. Current documents will be available at the location where they are needed, and they will be implemented by those performing the work.
3. Changes to documents, other than inconsequential editorial corrections, will be reviewed and approved by the same organizations that performed the original review and approval.
4. Records that provide documentary evidence of quality will be protected against damage, deterioration, or loss.
5. Requirements and responsibilities for document transmittal, distribution, retention, maintenance, and disposition will be established and documented.

QA.5 CONTROL OF PROCESSES

Performance Objective

Management shall define the requirements for controlling processes which affect the quality of items or services intended for use in projects or programs requiring a high degree of confidence that the final product will meet specified requirements.

Criteria

1. Special processes that control or verify quality will be performed by qualified and/or certified personnel in accordance with specified requirements.
2. Special processes will be controlled by instructions, procedures, drawings, checklists, travelers, or other appropriate means.
3. Critical process parameters, which could (a) affect the outcome of the project or program, (b) affect the safety of personnel, or (c) result in an insult to the environment will be maintained and controlled.
4. Measuring and test equipment used to control critical process parameters will be calibrated, as necessary, to meet program objectives and ensure safe, reliable operation.

QA.6 QUALITY PROBLEMS AND CORRECTIVE ACTION

Performance Objective

Management shall define the actions and responsibilities required to identify and report quality problems and initiate corrective action.

Criteria

1. All significant quality problems will be investigated and documented for management review as described in documented instructions and procedures.
2. When appropriate, corrective actions will be initiated and tracked to completion.
3. Surveillances or audits will be made to verify the effectiveness of corrective actions or any activity which requires a high degree of confidence that it will meet specified requirements.

CONTROL AND USE OF RADIOACTIVE AND HAZARDOUS PRODUCTS

Policy

The Chemical Technology Division will provide adequate information of the hazards to recipients of radioactive and hazardous materials supplied by the division.

Performance Objective

The Chemical Technology Division (Chem Tech) conforms to the provisions of applicable OSHA requirements and DOE Orders when it supplies radioactive and hazardous products to users.

Criteria

1. Chem Tech has in place the appropriate organization and administration to ensure that all required hazard communications are conveyed to users of chemical products that Chem Tech provides.
2. Approved procedures exist to receive orders from users (both internal and external to ORNL) with documentation of all product specifications that are to be met by Chem Tech.
3. Verification procedures exist to ensure that all external to ORNL recipients of radioactive products are properly licensed.
4. Hazard descriptions, precautions, and recommended control measures for all nonradioactive products are evaluated and communicated to recipients via Material Safety Data Sheets.
5. General cautionary information is provided to recipients on shipping documents for radioactive materials.

ENVIRONMENTAL PROTECTION

Policy

The Chemical Technology Division (Chem Tech) provides comprehensive accountability for environmental releases and potential environmental impacts from Chem Tech operations. All Chem Tech operations are conducted in compliance with applicable environmental protection laws and regulations, including DOE Orders.

EP.1 ENVIRONMENTAL RELEASES OF NONRADIOACTIVE CONTAMINANTS

Performance Objective

Chem Tech shall comply with applicable environmental protection laws and regulations, including DOE Orders, relative to direct releases to the environment and shall meet waste acceptance criteria for discharge to ORNL waste treatment systems.

Criteria

1. The environmental protection program shall be documented and include the key interrelated functions of organization, communication, planning, and reviewing.
2. All air emissions shall be in compliance with the Clean Air Act (CAA), as well as applicable federal and Tennessee regulations derived from the CAA, if discharged directly, or shall be in compliance with waste acceptance criteria for discharge into ORNL air treatment systems.
3. All direct air emission points shall be identified, necessary permits shall be in hand, and permit conditions shall be met.
4. All direct discharge of liquid effluent shall be in compliance with the Clean Water Act (CWA), as well as applicable federal and Tennessee regulations derived from the Act. All liquid effluent discharged to the ORNL treatment systems shall meet acceptance criteria for that system.
5. All of Chem Tech's direct wastewater discharges shall be identified in a current NPDES permit, and permit conditions shall be met. Chem Tech will be aware of permit conditions for discharges of division waste made after treatment by other organizations at ORNL.

EP.2 ENVIRONMENTAL RELEASES OF RADIOACTIVE CONTAMINANTS

Performance Objective

Radioactive releases to the environment due to Chem Tech operations shall be managed in accordance with applicable DOE Order requirements (DOE Order 5480.1, Environmental Protection, Safety and Health Protection Program Information Reporting Requirements) to ensure that releases are within guidelines and are maintained at as-low-as-reasonably-achievable (ALARA) levels (10 CFR 50, Appendix I). Airborne releases are also subject to EPA permitting under the requirements stipulated by the National Emission Standards for Hazardous Air Pollutants (NESHAPs) for CAA.

Criteria

1. The airborne releases, liquid releases, and solid wastes shall be identified and monitored. (Monitoring of releases is covered under the topics of Effluent Holdup and Treatment and Solid Wastes, which are under the Auxiliary Systems area.)
2. Environmental monitoring shall be designed to demonstrate environmental transport of radioactivity and facilitate pathway analyses. Analyses of potential radiological doses to the public shall be performed. Results shall be assessed to identify potential trends.
3. Environmental monitoring shall demonstrate potential environmental transport of radionuclides and shall be used and reported in accordance with DOE Order requirements.
4. Direct airborne releases shall be permitted in accordance with NESHAPs requirements, and permit conditions shall be met.

EP.3 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE

Performance Objective

Provisions shall be made to comply with applicable regulatory requirements relative to spill prevention, controls, and countermeasures for Chem Tech operations. Regulatory guidance is primarily from the CWA and derived regulations.

Criteria

1. Chem Tech shall comply with the ORNL Spill Prevention, Control, and Countermeasure Plan (SPCCP), which meets requirements, and the provisions in the plan shall be followed.
2. Chem Tech shall report all spills in accordance with DOE Orders.

EP.4 TOXIC SUBSTANCES CONTROL

Performance Objective

Management of toxic substances as necessary for Chem Tech operations shall be in conformance with applicable federal laws, as well as federal and Tennessee regulations. The Toxic Substances Control Act (TSCA and regulations derived from it) provide guidance for PCB controls. The NESHAPs requirements under the CAA and derived regulations control asbestos. The CWA provides guidance relative to drinking water standards.

Criteria

1. Toxic material shall be handled in conformance with applicable laws and regulations.

EP.5 HAZARDOUS WASTE MANAGEMENT

Performance Criteria

Management of hazardous (including mixed) waste consequent to CTD operations shall be in compliance with the requirements of the RCRA and derived federal and Tennessee regulations. DOE Order 5480.2, Hazardous and Radioactive Mixed Waste Management, also applies. These requirements encompass waste generation, treatment, storage, and disposal of hazardous wastes, as well as closure and postclosure care of disposal facilities.

Criteria

1. Hazardous waste shall be handled in compliance with RCRA and Tennessee regulations.

SECURITY/SAFETY INTERFACE

Policy

The Chemical Technology Division (Chem Tech) will ensure that it is kept informed of any ORNL security/safeguard plans that could impact safety and quality of CTD operations and that it maintains its involvement in the plans. The Laboratory Protection Division will work closely with CTD to accomplish this.

SS.1 FACILITY DESIGN COMPATIBILITY AND TRAINING

Performance Objective

Security/safeguards improvements should use design criteria consistent with the facility equipment/structures being protected.

Criteria

1. Design specifications for security/safeguards improvements require the same performance characteristics for natural phenomena as the facility equipment/structures being protected.
2. Security forces receive appropriate training in the chemical, radiological, and other special safety rules for the facilities with which they interact.

SS.2 EMERGENCY ACCESS

Performance Objective

Authorized facility and safety support personnel should not be denied access or exit in an emergency.

Criteria

1. Access for emergency equipment during an emergency is not impeded.
2. Ability to exit through crash-out doors or gates during emergencies is provided.
3. Manual override of controlled entry/exit devices is available during emergencies.

SS.3 FACILITY PLANNING FOR SECURITY/SAFEGUARDS EMERGENCIES

Performance Objective

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

Criteria

1. Responsibilities of facility operations personnel during safeguards/security emergencies at the facility are defined.

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