



Technical Trainer

Qualification Standard
Reference Guide

AUGUST 2006

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PURPOSE

The purpose of this reference guide is to provide a document that contains the information required for a National Nuclear Security Administration (NNSA) technical employee to successfully complete the Technical Trainer Functional Area Qualification Standard. In some cases, information essential to meeting the qualification requirements is provided. Some competency statements require extensive knowledge or skill development. Reproducing all the required information for those statements in this document is not practical. In those instances, references are included to guide the candidate to additional resources.

SCOPE

This reference guide has been developed to address the competency statements in the February 2004 version of DOE-STD-1179-2004, Technical Trainer Functional Area Qualification Standard. Competency statements and supporting knowledge and/or skill statements from the qualification standard are shown in contrasting bold type, while the corresponding information associated with each statement is provided below it. The qualification standard for the Technical Trainer contains 17 competency statements. This reference guide will address all the statements; however performance-based skills and abilities within those competencies will not be covered.

Every effort has been made to provide the most current information and references available as of August 2006. However, the candidate is advised to verify the applicability of the information provided.

Please direct your questions or comments related to this document to the Learning and Career Development Department, NNSA Service Center.

TECHNICAL COMPETENCIES

1. **Technical training personnel shall demonstrate an expert level of knowledge and ability to implement the systematic approach to training (SAT) model. This includes the ability to**
 - **conduct a job or task analysis or needs assessment, analyze the data, and provide recommendations based on results;**
 - **design a training course or program to satisfy training requirements;**
 - **develop a training course and supporting materials;**
 - **implement a training course or program; and**
 - **evaluate a training course or program as part of the SAT process or to assess return on investment.**
- a) **State the five steps of the SAT process and produce a basic sketch showing the relationship between the steps.**

The five steps of the SAT are analysis, design, development, implementation and evaluation.

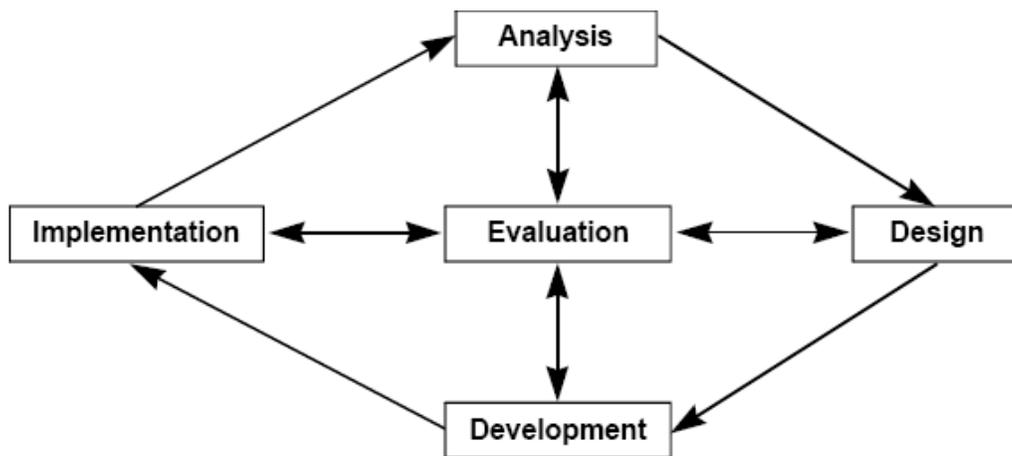


Figure 1. Sketch of the SAT

- b) **Referring to DOE-HDBK-1078-94, Training Program Handbook: A Systematic Approach to Training, describe in detail the activities that occur in each of the five steps of the SAT process, and list the products that may result from each of the steps.**

Following are concise summaries of each of the five steps of the SAT process.

Analysis

Analysis ensures training activities are oriented to job requirements by identifying the specific tasks involved in a given job. Training requirements are determined by analyzing the job and its component tasks. Organizational needs are also assessed to determine the resources required to support identified training requirements.

Design

Design begins with developing terminal and enabling objectives based on information gathered from the analysis phase. Skills and knowledge associated with performing a task well are translated into enabling objectives. The objectives are then organized into instructional

units and sequenced to aid the learning process. The objectives become the guides for the development of learning strategies, course content, and training materials. Additional design activities include identifying the appropriate training setting, developing test items and examinations (also done in the next phase), and documenting key components of this phase.

Development

Development is the actual preparation of lesson plans, instructor guides, training aids, and training materials. Formulation of additional enabling objectives and revisions of test items and objectives may also occur. Both technical and instructional reviews of the products are conducted, and changes are made as necessary to ensure the content is both technically and educationally correct and relevant.

Implementation

Implementation consists of resource allocation, planning, and scheduling, as well as the actual conduct of training. Resource allocation includes assigning instructors and support staff and scheduling training in facilities.

Evaluation

Evaluation is the critical feedback loop that helps to ensure that the training meets its objectives. Feedback from instructors, trainees, evaluators, and supervisors is reviewed to identify potential refinement of future training. Evaluation is a continuing action that occurs throughout the entire process and beyond. Evaluation results are translated into change actions or recommendations based on different criteria such as adequacy of content, tests, presentation, documentation, and post-training job performance.

Phase	Products
Analysis	<ul style="list-style-type: none"> ▪ Task list for a job or, for example, a new system or equipment ▪ List of job task skills and knowledge ▪ A determined or confirmed training need
Design	<ul style="list-style-type: none"> ▪ Learning and performance objectives, and terminal and enabling objectives ▪ Outline of instruction, including sequence, tentative settings, methods, and media to be used
Development	<ul style="list-style-type: none"> ▪ Lesson plans ▪ Instructor guides ▪ Trainee guides ▪ Media materials and equipment ▪ Piloting the training course/program
Implementation	<ul style="list-style-type: none"> ▪ Establishing or setting up the training setting ▪ Instructor training ▪ Instructor preparation and rehearsal ▪ Conduct of the training ▪ Training attendance sheets ▪ Completed trainee examinations ▪ Completed trainee feedback and comment forms

Phase	Products
Evaluation	<ul style="list-style-type: none"> ▪ Trainee, instructor, and supervisor post-training feedback forms ▪ Post-training testing results ▪ Training program assessments and evaluations ▪ Assessments of how well each phase of the systematic approach process is working

c) Describe the purpose and process for conducting a needs analysis, job analysis, and task analysis.

The three types of analysis — needs, job, and task — establish a “baseline” or foundation for the remaining phases. Needs analysis confirms that training is necessary. Job analysis defines the major aspects of a job. Task analysis provides the job and task performance data, and identifies requirements such as the skills and knowledge required to perform a job, task, or duty area.

Training needs are initially identified by reviewing regulatory requirements and existing training programs, and/or by conducting a needs analysis. These activities enable facilities/sites/offices to determine training needs originating from performance problems, regulatory requirements, and in some cases, requests for additional training or changes to existing training.

A job analysis is conducted to develop a detailed list of duty areas and tasks for a specific job or position. It can also supply information to develop a job/position description, if desired. Job analyses allow for the comparison of existing training programs to established requirements to identify deficiencies in the adequacy of program content. For existing programs, the job analysis provides reasonable assurance that all tasks essential to safe and efficient operation are addressed by the training program. It also identifies parts of the training program that are unnecessary, thus resulting in a more effective training program and more efficient utilization of resources. For facilities/sites/offices developing new programs, the job analysis provides the information necessary to identify tasks associated with the job. Training design and development activities can then be based on actual needs, as opposed to perceived needs.

All pertinent information regarding a position-specific job analysis should be documented in a job analysis report, which becomes part of the training program file for each specified position. This report describes the process/methodology used to conduct the job analysis, the names and positions of individuals conducting the analysis, and the results of the analysis.

As training is designed and developed for the tasks selected for training, each task should be analyzed to determine the knowledge, skills, and abilities required for satisfactory accomplishment of the task.

Task analysis data collection forms should be developed to meet specific division/department needs. Task information to be collected includes

- initial conditions (prerequisites) required for task performance;
- standards (criteria) for acceptable task performance (e.g., limits, ranges, time requirements);

- critical elements (steps) that must be performed to accomplish the task properly;
- associated knowledge, skill, and ability statements required to perform particular elements of the task or the overall task.

Procedures for conditions, standards, and elements associated with a task may be referenced if the information is adequately addressed in the procedure.

Task analysis information may be collected by one or more of the following methods:

- Incumbent/subject matter expert interviews using guidelines or previous task analyses
- In-depth procedural review
- Subject matter expert consensus group meetings

The particular method(s) used will be dependent upon manpower availability, plant production/operation requirements, and budgetary restraints.

d) Describe the functional relationship between tasks, learning objectives, training materials, and trainee evaluations.

Tasks and associated skills and knowledge are translated into performance and learning objectives. The learning objectives in turn are used to create the course outline, which becomes the road map for the course developers in preparing lesson plans, test items and examinations, student materials, and training aids and equipment. This material is used by the trainers to conduct or present the training. All of this information is used to assess the effectiveness of the training program, which should be job- or performance-based as a result of the application of the SAT. The evaluation results, which become source data for the needs analysis process, are used to modify the training program.

e) State and describe the components of an internal training program evaluation process to assess the effectiveness of training.

Evaluation consists of a periodic review of the training materials and methods of soliciting feedback from former trainees and their supervisors on the effectiveness of training. The major outputs of evaluation are the decisions made to improve the training program during all phases.

After the terminal objectives have been written, it is necessary to ensure that training materials are directly linked to the objectives. The development of a Training/Evaluation Standard (TES) can help to ensure that this vital link is maintained. The purpose of the TES is to provide the basis for the development of objective-based training materials and to maintain consistency in the evaluation of student performance. Each TES is directly related to a specific job task (or group of very similar tasks) identified during job analysis.

The TES contains two sections: training and evaluation.

The training section contains the task title and number, the terminal and enabling objectives, and the applicable references. The information contained in this section will form the basis for the training development activities that follow.

The evaluation section contains a performance test that includes prerequisites, amplifying conditions and standards, and instructions to the trainee and the evaluator. This performance test is used to measure the adequacy of a trainee's performance on a particular job-related task. There are several names used for the evaluation section of this standard, each varying in format and degree of documentation (e.g., job performance measures, qualification standards, and on-the-job training checklists). The evaluation section of the TES can also be used to evaluate the performance of existing job incumbents. Incumbents may not have had the opportunity to participate in the newly developed performance-based training program. By evaluating their performance using the performance test in the TES, the merit of prior training can be assessed, and appropriate remedial training can be assigned if necessary.

- f) Based on an analyzed training need, design, develop, implement, and evaluate a course of instruction.**
- g) Evaluate how well a given training organization has implemented the five steps of the SAT process.**

Elements "f" and "g" are performance-based competencies. The qualifying official will evaluate the completion of these competencies.

2. Technical training personnel shall demonstrate a working-level knowledge of DOE training organizations, strategic initiatives, roles and responsibilities, and training administration and infrastructure.

- a) Describe the current initiatives of the DOE Office of Training and Human Resources Development, and explain how they apply to the field and headquarters training offices.**

As of March 2006, the Department of Energy (DOE) was in the final stages of its implementation plan and transitional phase of the new Enterprise Training Services (ETS) organization and customer service delivery system. As a result of feedback from customers, employees, managers, supervisors, and labor unions, the ETS Program Headquarters Core Group and Operations Centers are making adjustments to the design of the master implementation plan to focus on job assignments and immediate infrastructure objectives and to ensure the new ETS policies and procedures are clear and understandable.

The ETS initiative emphasizes a strong bond between employee and core business delivery results that contribute to the accomplishment of the Department's essential mission. A major feature of the ETS organization is the use of a DOE Federal Training Function A-76 Study Performance Work Statement with job function and task objectives focused on results. The Performance Work Statement (PWS) and Performance Requirements state specific objectives for delivery of training support services. These performance standards create the "line of sight" that shows how individual performance can contribute to organizational goals being achieved, and will serve as the primary basis for employee performance ratings in the performance management system.

Performance standards and quality assurance surveillance plan factors and descriptors continue to play a key role in establishing and assessing performance expectations.

The implementing issuance memo for the ETS organization is effective December 13th, 2005, and is subject to continuing collaboration with the residual organization (RO) and the most efficient organization (MEO). Training materials will be revised to reflect the newly designed system.

ETS deployment of the new organization was on track for July 1, 2006.

b) Describe the Federal Technical Capability Program (as listed in DOE M 426.1-1, Federal Technical Capability Manual) and its application to the field and headquarters training offices.

The DOE is committed to ensuring that employees are trained and technically capable of performing their duties. In pursuit of this objective, the Secretary of Energy issued DOE P 426.1, Federal Technical Capability Policy for Defense Nuclear Facilities, dated December 10, 1998, to institutionalize the Federal Technical Capability Program (FTCP). This program specifically applies to those offices and organizations performing functions related to the safe operation of defense nuclear facilities, including the NNSA. It applies to all aspects of recruitment, deployment, development, and retention of federal employees in these organizations.

The Secretary of Energy has delegated authority for implementing and maintaining the FTCP to the Deputy Secretary of Energy. Other DOE offices and organizations must ensure their federal employees are appropriately trained and technically capable when carrying out their responsibilities. When appropriate, these offices and organizations should implement applicable portions of the FTCP.

The objective of the FTCP is to recruit, deploy, develop, and retain federal employees with the necessary technical capabilities to safely accomplish the Department's missions and responsibilities. The Department has identified guiding principles to accomplish that objective and identified four general functions of the FTCP. The Department's Integrated Safety Management Guiding Principles state that

- federal personnel possess the experience, knowledge, skills, and abilities that are necessary to discharge their safety responsibilities;
- line managers are accountable and have the responsibility, authority, and flexibility to achieve and maintain technical excellence;
- supporting organizations (personnel, training, contracts, finance, etc.) recognize line managers as customers and effectively support them in achieving and maintaining technical capabilities;
- an integrated corporate approach is required to ensure that necessary technical capabilities and resources are available to meet the overall needs of the Department's defense nuclear facility missions.

c) State and discuss some of the attributes of an efficient and effective technical training organization at a defense nuclear facility.

Organization of training is a strategic issue because it affects so many areas. Organization affects the linkage and communications channels between the training organization and its customers. The ability of the training organization to recruit and support specialized expertise in instructional design and other training and education specialties are affected by the organizational structure. Structure also affects the ability to establish and manage the

training processes, the efficient and effective teaming of subject matter experts (SMEs) with instructional specialists, and the ability to measure and control results.

There is no single training organization structure that is best for all situations. In fact, as conditions evolve in a company, the training structure should evolve to fit the new conditions.

Part of the management and operating (M&O) contractors' training strategy should be the periodic review of the effectiveness of the current organizational structure and planned changes as conditions evolve within the organization and/or facility.

The old architects' maxim "form follows function" also applies to the design of training organizations. The organization's form should be determined by its function. The structural design should be driven by the company's strategic vision and goals and by the amount of work to be performed and resources to be organized to accomplish the work. Examples of questions that should be addressed when establishing a training organization structure include the following:

- What training responsibilities will be delegated to the training organization(s), and what responsibilities will be retained by line managers?
- To what degree is it appropriate to centralize certain training responsibilities?
- How will the organization support the specialized expertise needed to achieve strategic training goals such as implementing alternative delivery media and addressing the training requirements for emerging and changing technologies?
- How will the organization, structure, and management of the training functions mesh with the overall philosophy of the contractor and the parent organization?
- How will the organization manage control of training results and training costs?
- How will the organization facilitate clear communication between the training unit(s) and their user groups?
- How can expensive duplication of the development and implementation of training materials be effectively avoided?
- How can the training function be structured to get the greatest return for the training investment?
- How much of the training program will be based on generic courses and how much will be based on custom-designed courses?
- What structure will best ensure responsiveness to changing user needs?

Following are guidelines to consider when organizing the training function:

- Formulate and implement a training policy to support the needs of operations. The training policy should be based on a broad vision of employees' training, education, development, and qualification needs, and the skills and experience required to meet those needs. Other policy considerations include, but are not limited to: management's use of training to prepare professionals to meet the challenges of cultural, managerial, organizational, and technological changes; using training to acquire and reinforce skills in safety, environmental concerns, and production costs; and sharing responsibilities and tasks between the corporate structure and the individual sites and facilities.

- Create a position for a senior-level training manager. Training organizations should have a training manager who has responsibilities and authorities broad enough to provide leadership, to oversee training across the entire organization, and to represent the training area with senior management. The position should be at the highest management level possible, with proper consideration given to the size of the overall organization.
- Determine the size of the training organization. Training organizations that try to be all things to all people become unwieldy, bureaucratic, and unresponsive to their users. Even in cases where training is centralized, there are training functions that are better suited to other organizations (i.e., on-the-job training [OJT]). Do not try to force all training functions into one large training organization. Training organizations should, however, be large enough to support the specialized expertise needed by smaller units. Small units located around the site without specialized support seldom achieve the cohesiveness necessary to support their individual needs. Specialized expertise in functions such as the following may be required to enable individual facilities to accomplish their mission:
 - Performance analysis and training needs analysis
 - Curriculum design and instructional design and development
 - Testing, measurement, and evaluation
 - Alternative delivery media such as computer-based training
 - Video and audio scripting and production
- Centralize the development of common instructional materials. There is no need for each organization (e.g., operations, maintenance, environmental restoration) to develop its own basic courseware when the instruction has a common core, such as Hazardous Waste Operations and Emergency Response (HAZWOPER), Radiation Worker, or Occupational Safety and Health Administration (OSHA) training. It is more efficient and economical to modify core materials to fit the needs of the affected organization than it is to repeatedly conduct the initial development efforts.
- Provide leadership in the areas of instructional methodology, technology, and procedures. Organizations with multiple training organizations, each espousing different methods, standards, and procedures, have great difficulty sharing curriculum, course materials, and administrative systems. Training organizations should consider having one group or sub-unit charged with instructional methodology and consulting within the organization.
- Follow a systematic project plan and process to develop instructional materials. The planning and use of training resources is a critical element in the success of any training organization. Training material content, level of detail, testing, and evaluation should be consistent across the facility and should be systematically developed. Interrupting development of one course to teach another course can adversely affect development projects, particularly if the people have heavy teaching loads. Training workloads should be adjusted to provide the support needed for the development or revision of courses. Instructors who will teach the courses should be used as technical advisors to the development team to ensure accuracy and relevance, and to accommodate changing priorities.
- Use strategic planning to prepare for the future. Strategic, long-term planning should be an integral part of the training function. Using training as a quick-fix in correcting problems encountered as a result of poor up-front planning should be avoided.

d) State and discuss the advantages and the disadvantages of centralized and decentralized training organizations.

Whether to centralize, decentralize, or integrate the training functions is a major consideration when designing the structure of an organization. American business, industry in general, and DOE M&O contractors specifically, have struggled with this question in recent decades. Industry and contractors continue to search for the right mix of overall direction and local delivery of training.

Centralization of Training

Technical training systems are considered centralized when the function is coordinated and/or controlled primarily from a single organization within the company. In training organizations with personnel who need strong, clear direction, or where individual ownership of the job is minimal, managers find greater quality control with the training function centralized. Centralized training administration is also valuable in circumstances where conformity to standards, uniformity in application, and formal documentation is essential. The following strengths and weaknesses come from the experiences of many corporations and are documented in recent literature on the subject. The relative impact of each of the strengths and weaknesses are obviously a function of the implementing organization.

Strengths

- Consistency in training material and content
- Consistency in the articulation of organizational values
- Economy of scale
- Improved consistency in instructional design and presentation methods
- A common structure for sharing and exchanging information

Weaknesses

- Loss of local autonomy, control, and ownership of training programs
- Loss of customization of training content
- Potential for decisions to be made at the least effective decision-making level
- Difficulties in changing and adapting to new needs
- Potential for inhibiting initiative and personal responsibility

Centralized control over technical training may not be appropriate for all organizations. In some cases, strong centralization of the training function has led to an over-emphasis on the form and structure of training design and development, which did not add sufficient value and increased the cost of training unnecessarily. Over-centralization of training has also resulted in reduction of facility line management involvement with formulating and conducting training programs and with follow-up actions. In some cases, training has been designed around guidelines, typical scenarios, and catalogs rather than around the changing needs of individuals or technologies. Sacrificing training content and needs (function) to administration and structure (form) and losing line management ownership and participation in training are pitfalls of centralization that must be guarded against.

Decentralization of Training

Technical training systems are considered decentralized when control over training functions is delegated to a local organizational level and there is no common point of coordination among separate facilities or training entities within the larger organization. Decentralized training organizations are autonomous organizations within divisions of the company that organize and implement their own programs and conduct their own evaluations. A decentralized structure generally works well in an organization which produces a diverse array of products or uses several different processing methods or levels of technology. A decentralized structure places technical training closer to line operations and allows training to develop closer relationships with the operations personnel, from whom technical trainers must draw their expertise. The following strengths and weaknesses have been identified through research and experience. As with anything, these can be either minimized or exacerbated by the implementing organization.

Strengths

- Immediacy and credibility of the training programs
- Greater ownership of training program content and products
- Greater line management involvement
- Training fits cultural and geographic diversity
- Decision-making is closer to the customer
- Local budget control

Weaknesses

- Potential for inconsistencies in training program content and materials
- Difficult to share and exchange information and training programs due to diversity
- Demanding on human and material resources
- Potential for inconsistent (or lower) quality of training and training materials

A decentralized training structure is more susceptible to the influence of local management and can be more difficult to control and monitor. Research shows that a decentralized structure is generally inefficient in organizations where most products or processes are similar within a division or department or among several facilities. It is also more difficult to link technical training to the higher-level mission and strategies of the organization and for corporate management to provide coordination. Decentralization may lead to duplication, and care must be taken to coordinate course development to utilize all developed courses across the organization.

e) Explain the purpose of a training policy and procedure manual and discuss the typical policies and procedures that may be found in this manual.

The training management manual should formalize facility policies and procedures for training. Examples of sections that should be included in the manual follow:

- Introduction and Organization
 - purpose and scope of the manual
 - manual compliance requirements
 - training program purpose and goals
 - organizational relationships and reporting structure

- Qualification and Training Program Descriptions
 - overview of qualification and training programs
 - new employee orientation or indoctrination
 - visitor indoctrination
 - subcontractor indoctrination and training
 - descriptions of all training programs (individually or by groups)
 - instructor training and qualification
 - continuing training
 - proficiency requirements
 - requalification (periodic, following disqualification, lapsed qualification, etc.)
- Training Program Material Development and Administration
 - training/evaluation standards
 - checklists or qualification cards
 - lesson plans, OJT guides, lab guides, etc.
 - training aids and reference material
- Training Program Standards and Policies
 - academic standards
 - examinations
 - OJT (conduct and evaluation)
 - lectures, seminars, training exercises, etc.
 - drills
 - signature requirements
 - student conduct and controls
 - disqualification procedures and policies
 - exceptions, extensions, and waivers
- Administration
 - training and qualification records
 - selection and qualification of instructors
 - training program development/change requests
 - audits (internal and external)
 - evaluating training program effectiveness
 - control of subcontracted training

f) Describe the roles and responsibilities of line management, the training organization, and the employee as related to training and qualification.

Line managers are responsible for the training, qualification, and performance of operating organization personnel to support safe and reliable operations. Line managers should verify that training meets the needs of their organizations to help ensure the safe and reliable operation of their facilities. This is accomplished by a variety of methods including observation of training and qualification activities, observation of personnel performance on the job, and interviews that can identify knowledge or skill weaknesses. Line managers should provide results of their training reviews as feedback to training department managers in order to improve the training program.

Performance standards established by line managers should be presented, discussed, and reinforced during initial and continuing training. Understanding of these standards should be verified during employee training evaluation and the qualification process. Line manager

standards of performance, such as policies, procedures, and standing orders, should be written. Industry experience has shown that standards need a thorough explanation so that expectations are clear. Many line managers have found it effective to discuss and explain their standards of performance during training sessions because they can focus attention with minimal interruptions. For example, an operations manager can reinforce the expectations of team communications following an exercise by using examples from that exercise. Similarly, a maintenance manager can reinforce expectations of adherence to procedures during hands-on pump alignment training. Periodic review and reemphasis of performance standards and expectations are helpful during training, particularly if done by managers, when expectations are not being fully met.

The importance of conducting work activities according to approved practices and procedures should be emphasized continuously, especially during training. Additionally, the reasons behind work standards should be explained. This information is best explained by line managers and supervisors. Personnel who understand the reasons for a standard are better able to meet their management's expectations.

Line managers should monitor and assess personnel performance to determine how well established standards are being met. Results of the assessments can be used to determine training effectiveness and to revise training programs or develop other corrective actions.

The roles and responsibilities of the training organization are to

- manage assigned training functions, including, but not limited to
 - training compliance with applicable laws, regulations, policies, requirements, and provisions of training agreements;
 - training policy and program development;
 - training program cooperation and liaison with other DOE elements;
 - training program evaluation and self-assessment.
- approve and coordinate additional approvals, authorizations, and/or concurrences for training for any federal employee if officials with responsibility for that employee's training are not located at that duty station.

g) Explain how to use facilities, equipment, and materials in an efficient manner to implement the training process.

To ensure that facilities and resources are available to support training activities, the training manual should address physical facilities, equipment, and reference materials.

Physical facilities and equipment include the following:

- Classroom facilities
- Laboratories and workshop facilities
- Simulators
- Audiovisual aids and equipment
- Tools and equipment
- Office space and furnishings

Technical reference material should cover topics at a level appropriate for the program, instructor, and trainee; should be applicable to facility systems and equipment; and should be current with facility modifications.

h) Describe the purpose and attributes of a technical training resource library.

Improved facility performance due to the training organization is often the basis for the allocation of facility resources to training. This provides future impetus for the training organization to consistently provide high-quality training.

The training environment should promote learning and support a variety of instructional techniques. This environment should include facilities such as classrooms, simulators and laboratories (if applicable), and mock-ups designed and maintained to meet training program requirements. Training support services, such as reference libraries and quiet study areas, should be available and maintained to meet personnel and instructor needs. Training staff facilities should encourage development of high-quality instructional material, instructor preparation, and personnel counseling.

Training settings, such as simulators and laboratories, should reflect actual facility equipment and the working environment as closely as possible, and should be reviewed and updated continually. Noted differences should be explained to personnel before training begins.

Instructional media equipment and support should be available and maintained to allow for a variety of instructional methods for achieving learning objectives. Effective information systems, including accurate databases, should be used to manage training activities.

The training organization should be staffed with personnel who are technically qualified, respected by facility personnel, and who are trained instructors. If subcontract personnel are used, they should have the knowledge and skills necessary for assigned responsibilities.

i) Describe the process necessary to share training materials and resources among the federal and contractor training organizations.

Technical fundamentals are an important part of a comprehensive training program for numerous positions in operating organizations at Department-owned nuclear facilities. The Department has developed fundamentals training materials for several key areas that address the theory necessary to support technical operations in many facilities. This material is useful in initial and continuing training programs, and has been used by many of the DOE contractor organizations.

Because the Department developed the material and it is available without cost to DOE and DOE contractors, recipients realize a significant cost savings when the material is used. The material is generically applicable to many functional job positions and requires little or no revision by contractors to meet their needs in this area. Use of the material precludes the necessity for costly internal development for contractors with employees that require fundamentals training.

Fundamentals training material has been developed and is available to DOE and contractor organizations in the following topical areas:

- Mathematics
- Classical Physics
- Nuclear Physics and Reactor Theory
- Materials Science
- Electrical Science
- Mechanical Science
- Chemistry
- Engineering Symbology, Prints, and Drawings
- Heat Transfer, Fluid Flow, and Thermodynamics
- Instrumentation and Controls

Calculation of the savings associated with provision of fundamentals training materials involves some estimation. Because the material that is available has been developed to meet a need or requirement, the initial cost of development need not be recovered when determining savings. Each time a DOE or contractor organization adopts available material, a cost savings is realized because the material did not have to be developed internally. This savings will be significant in many instances because the expertise is often not available locally for much of the material and outside vendors would have to be used if the material were developed internally.

Additional information regarding sharing of training materials is available in Calculating Cost Savings from Sharing of Training Materials, January 1997, available at <http://www.eh.doe.gov/nsps/training/costsav.pdf>.

- j) Participate on a local headquarters-sponsored fact-finding team, working group, or related training and human resources initiative that assesses impact, supports, or implements a DOE human resources initiative.**

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

- k) Using DOE-HDBK-1001-96, Guide to Good Practices for Training and Qualification of Instructors, describe the qualification, requalification, and monitoring of trainers, including OJT instructors, needed to ensure the effectiveness of training.**

Qualification requirements should be established and documented for all facility and subcontract personnel, including occasional/casual instructors who perform training activities. (An occasional or casual trainer is an individual who only instructs several times a year; training is not a part of his/her job description.) These requirements should be based on instructor qualification levels, and should address instructional competence, technical competence, and applicable interpersonal skills. All subcontract instructors should meet the qualification requirements for the subjects they teach and/or develop.

Instructor trainees who are not fully qualified, as well as occasional instructors, should have limited participation in instructional activities. These individuals should perform assignments under the direct supervision of a qualified instructor or a training supervisor.

All instructor trainees who are assigned instructional activities should be formally evaluated by a qualified instructor or a training supervisor.

On a case-by-case basis, determined by testing or experience, an instructor trainee may be granted an exception to specific training program requirements. If an instructor trainee can demonstrate mastery of some/all of the course learning objectives prior to the training, an exception is warranted.

Administrative procedures should be developed that allow training management the option of releasing such an individual from portions of a qualification program's requirements. All exceptions granted should include a written justification.

A job analysis for a DOE facility's instructors and instructional technologists is not required. However, it is recommended that each facility analyze its work activities to ensure that training-related tasks and their associated knowledge and skills are identified and documented for each instructor qualification level. Analysis results should be compared to the facility's instructor training programs to verify that required knowledge (at the proper cognitive level) and skills are provided in the content of each program. Further, these analyses should be used to establish entry-level requirements (education, training, and work experience) for each instructional qualification level.

The knowledge and skills developed by the facility's instructor training programs should also be compared with the representative instructional competencies. This comparison should help to verify the adequacy of, or identify deficiencies in, the facility's analyses, and should also identify generic competencies that may not be needed in facility-specific training programs.

Competencies that are identified as applicable to a specific instructor training program should be rewritten in the form of terminal and enabling learning objectives.

In all cases, programs should be in place to develop the specific knowledge and skills required for each instructor's qualification level. It is recommended that if a facility does not conduct its own analysis of training-related activities, the content of its instructor training programs should be based on a systematic evaluation process.

Training staff who perform as instructors in the development, presentation, or evaluation of technical topics should possess technical qualifications consistent with their assignments. Technical qualifications should include theoretical and practical knowledge as well as practical work experience at or above the level that is required of the trainee population. Instructors who initially lack practical work experience should complete portions of operator/technician/craft training programs related to the topics taught. These instructors should thoroughly understand the subject matter and its relationship to overall facility operation.

Each facility should establish written procedures that stipulate what these technical qualifications will be, to whom they apply, and how they may be attained for each instructor qualification level. For example, instructors at DOE category A reactor facilities who teach subjects such as technical safety requirements, operating practice, and control manipulations to certified reactor operators and senior reactor operators should have received senior reactor

operator (or equivalent) training. Instructors who teach integrated facility response at DOE non-reactor nuclear facilities may also need facility operator (or equivalent) training.

To establish and maintain effective instructor training programs, a periodic or continuing evaluation of each program is necessary. The frequency of these course evaluations should change over time. Following initial training program development, evaluation on a three to six month period may be required. After this initial period of evaluation and course modification, evaluations should be conducted on a one- to two-year frequency.

Evaluation relies on effective two-way communication between the instructional technologists, the course instructors, the training supervisors, and the instructor trainees. Evaluations should encourage program updating and guide program improvements. Program evaluations should include the following items:

- Trainee examination (evaluation) results from the instructional basics and qualification level specific instructor training
- Task-based feedback from former trainees to assess program effectiveness
- Post-training surveys of training supervisors to assess adequacy of program content
- Instructor performance evaluations by trainees, training supervisors, and appropriate line management
- Deficiencies noted in other evaluations and the resulting corrective actions
- Review of DOE and industry guideline/good practices documents
- Review of competency lists versus content of current instructor training programs

Changes in program content, instructional materials, training methods, examination techniques, training facilities, or instructional staff should be identified and assigned to training management representatives for action. Responsibility for tracking corrective actions should also be assigned.

3. **Technical training personnel shall demonstrate the ability to plan, conduct, and document a training needs assessment or job analysis of a position to determine the training requirements associated with that position.**
 - a) **Using DOE-HDBK-1078-94, Training Program Handbook: A Systematic Approach to Training, section 2 and associated attachments, DOE-HDBK-1074-95, Alternative Systematic Approach to Training, DOE-HDBK-1076-94, Table-Top Job Analysis, and DOE-HDBK-1103-96, Table-Top Needs Analysis, describe in detail the process for identifying and documenting performance-based training requirements (including alternate methods). Discuss the conditions for using an alternate methodology.**

The process descriptions contained in this section describe a systematic approach to identifying and documenting performance-based training requirements. The types of analysis used for identifying training requirements include needs analysis, job analysis, and task analysis. These analyses will provide assurance that training is the appropriate solution to performance problems and identify requirements that serve as the basis for the design and development of performance-based training programs.

Needs Analysis

Training needs are initially identified by reviewing regulatory requirements and existing training programs, and/or conducting a needs analysis. These activities enable facilities/sites/offices to determine training needs originating from performance problems, regulatory requirements, and in some cases, requests for additional training or changes to existing training.

Job Analysis

A job analysis is conducted to develop a detailed list of duty areas and tasks for a specific job or position. It can also supply information to develop a job/position description, if desired. Job analyses allow for the comparison of existing training programs to established requirements to identify deficiencies in the adequacy of program content. For existing programs, the job analysis provides reasonable assurance that all tasks essential to safe and efficient operation are addressed by the training program. It also identifies parts of the training program that are unnecessary, thus resulting in a more effective training program and more efficient utilization of resources. For facilities/sites/offices developing new programs, the job analysis provides the information necessary to identify tasks associated with the job. Training design and development activities can then be based on actual needs, as opposed to perceived needs.

All pertinent information regarding a position-specific job analysis should be documented in a job analysis report, which becomes part of the training program file for each specified position. This report describes the process/methodology used to conduct the job analysis, the names and positions of individuals conducting the analysis, and the results of the analysis. The following paragraphs provide general guidance pertaining to performing job analyses.

Review available job information. The first step in job analysis is a review of available job information. This review provides input to an initial list of tasks and duty areas, and serves as the starting point for further analysis. The following are examples of the types of documents that should be reviewed:

- Standard operating procedures
- Group, department, and/or division procedures
- Standing directives and standard practices
- Technical safety requirements
- Occurrence reports
- Job questionnaires/job descriptions
- Equipment/system operating manuals
- Existing qualification documents
- Studies employing job or task analyses of similar jobs (e.g., DOE, Edison Electric Institute, Institute of Nuclear Power Operations, Nuclear Regulatory Commission)

Information gained from observation of job incumbents performing the tasks should be used in the review, as should any data that has been collected related to extremely effective or ineffective performance. This review is conducted for the following reasons:

- It enables the person conducting the analysis to better understand the nature of the job.
- It identifies how much, if any, of the job analysis work has already been completed.
- It yields information to write a job description if one does not already exist.

Select and train job analysts. Personnel selected to conduct the job analysis should include SMEs, supervisors for the job or position undergoing analysis, and representation from departments involved in the decision-making process. These departments may include operations, training, and human resources. Representation from these groups promotes better cooperation and understanding during and after the analysis. The persons selected should be supportive of the job analysis activity and trained in the process.

Training for those participating in the job analysis is necessary because the participants are much more likely to be knowledgeable in the details of the job being analyzed than they are in the process by which the analysis is conducted. A short course is recommended to explain the purpose, value, and methodology for collecting job analysis data.

Develop the task listing. In addition to the information obtained from the document review, SMEs from the prospective user group are consulted for compilation of the task lists. A task list is developed using the following general process:

- The job is broken down into duty areas that are part of the job responsibilities.
- Initial task lists are developed.
- Task statements are written to describe individual tasks.

Duty areas are groups of tasks that constitute a major subdivision of a job. They integrate specific knowledge, skills, and abilities required by the job. An example of a duty area for a reactor operator may be the emergency core cooling system; for a cascade operator, the cascade compressor lubricating oil system; and for a hot cell operator, the cell ventilation system.

Examples of tasks for the above duty areas are: start up the emergency core cooling pump; shift, inspect, and clean the lubricating oil strainers; and, align the ventilation system for negative cell pressure, respectively.

Task statements should be written such that they are clear, complete, concise, relevant, and stated at a consistent level.

Validate the task listing. Validation of the initial task list can be accomplished in numerous ways. A tabletop discussion using three or four SMEs, job-qualified employees, and supervisors can provide reasonable assurance that the initial task listing is accurate.

Interviewing a limited number of job incumbents may also be an appropriate method. The primary concerns of the validation process are to ensure that

- all tasks performed are included on the task list;
- the task statements accurately describe the tasks;
- only those tasks associated with the job are included on the task list.

Prepare the survey questionnaire. Questionnaires are prepared for distribution to job incumbents. They are used to verify the accuracy and validity of the initial task list and identify which tasks will be selected for training. Each questionnaire includes appropriate instructions for filling out the form; a section for demographic information (personnel data); task listings appropriately grouped by functional duty areas; rating scales designed to gather information regarding the characteristics of each task; and a listing of the tools, equipment, and references for task performance.

The job incumbent is asked during the survey to assign ratings in the following categories: task importance, task difficulty, and task frequency.

The rating system is based on the criteria contained in “Task Rating System” (Figure 2). Clear, complete instructions should be included on the questionnaire. Figure 3 is a questionnaire example that may be used.

Select the survey sample and conduct the survey. Questionnaires should be administered to a representative sample of the overall group, division, or department to ensure validity of response information. Considerations to be made concerning number and types of survey respondents include experience of the job incumbents, availability, and restrictions imposed by operational or production requirements. Qualified supervisors should be included in the survey. The survey sample size should be as large as possible to ensure a representative sample of the prospective work group population.

Analyze the survey results. Survey results are compiled and analyzed by the training organization. At a minimum, the reported results should contain the following:

- Frequency of task performance
- Importance (consequences of inadequate performance)
- Difficulty of task performance
- All additional tasks identified by survey respondents that were not included in the initial survey

Any differences between supervisor responses and job incumbent responses are resolved during the analysis of the data. Differences may occur because of the different perspectives of the respondents and the emphasis each group places on individual tasks. Large deviations in numerical responses to individual tasks should also be investigated during this analysis. Data from the averages of the supervisor questionnaires are used to help determine the validity of the survey.

Survey results can be compiled by hand or by use of a computerized data base management system. Several software systems are readily available if a computer system is used. Before the responses are entered into the data base, each returned questionnaire should be checked to identify any problems that might invalidate responses. Upon completion of data entry, the survey data can be analyzed as desired for the overall ratings of each scale for each task. These results can then be used to determine which tasks, if any, are selected for detailed analysis.

Frequency of Performing Task	
Minimum	
1.	Less than once per year
2.	Once every five to twelve months
3.	Once every three weeks to four months
4.	Once every one to two weeks
5.	More frequently than once per week
Maximum	
Importance of Task	
Minimum	
1.	Consequences of improper performance are negligible (improper performance would make no difference in plant operation)
2.	Consequences of improper performance are undesirable (improper performance may impair reliability of a system or a process)
3.	Consequences of improper performance are serious (improper performance may require an Unusual Occurrence Report)
4.	Consequences of improper performance are severe (improper performance may result in an Alert Event)
5.	Consequences of improper performance are extremely severe (a serious injury or site emergency may result)
Maximum	
Difficulty of Performing Task	
Minimum	
1.	Very easy to perform
2.	Somewhat easy to perform
3.	Moderately difficult to perform
4.	Very difficult to perform
5.	Extremely difficult to perform
Maximum	

Figure 2. Task rating system

INTRODUCTION

This survey is designed to gather information about the _____operator position at_____. Its specific purpose is to obtain from you, the job incumbent, information concerning technical tasks that make up your job. The information collected from this survey will be used by the training department to design training programs which reflect actual job requirements. This is possible only with your cooperation. Please consider each item listed in the survey carefully. Your contribution to this effort is essential. If you have any questions or problems related to this survey, please contact the training department. Thank you for your assistance in this effort.

GENERAL INSTRUCTIONS

Before beginning this survey, look through the booklet and become familiar with the contents and all instructions. It is important to review the task inventory and become familiar with it in order to make a valid assessment of each task statement.

The survey is divided into two sections:

Section I—Biographical Information—Asks for some information about your background, general job description, and plant facilities. These descriptions will be used to sort survey responses into common groups. In the event that clarification of a response is required, your name is requested. All survey responses will be treated confidentially.

Section II—Task Statements—Contains a listing of specific tasks which may or may not be part of your particular job. These tasks are grouped by systems or duty areas, and related tasks are kept together to make it easier for you to think about any tasks you perform that may not have been listed. You are asked to rate each task in terms of its frequency, importance, and overall difficulty. These terms are defined on more depth on the following pages.

Remember that your responses to the items in this survey should reflect what you do when performing your job as an operator. If referring to a procedure or reference would assist you in responding to an item, please feel free to do so, but give your own opinion.

Figure 3. Sample survey questionnaire

SECTION I—BIOGRAPHICAL INFORMATION

Name: _____

Date: _____

1. What is your present job level? (Mark one)

Supervisor

Operator

Operator Trainee

2. How long have you worked in your present job title? ____ Year(s) ____ Month(s)

3. What is the highest level of education you have received?

a. ____ Grade school

b. ____ Attended high school, but did not graduate

c. ____ Graduated from high school or equivalent

d. ____ Attended trade/vocational school, but did not graduate

e. ____ Graduated from trade/vocational school

f. ____ Attended college, but did not graduate

g. ____ Graduated from college.

4. How many years of formal vocational/technical education have you had beyond high school?

a. Military schools _____ years _____ months

b. Nonmilitary schools _____ years _____ months.

5. Please place a check mark beside each of the areas below in which you have had at least six (6) months experience:

Area I: ___ C-331
 ___ C-315
 ___ C-310
 ___ C-310A

Area II: ___ C-333
 ___ C-333A
 ___ RCW

Area III: ___ C-360
 ___ C-350
 ___ C-340

Area IV: ___ C-337
 ___ C-337

Building: ___ C-300

Figure 3. Sample survey questionnaire (continued)

SECTION II—TASK STATEMENTS

Instructions

This section contains a list of tasks each of which may or may not be part of what you do on your present job. Because this survey is being taken by individuals with several experience and responsibility levels, we expect that some individuals will not perform many of the tasks and few individuals will perform all of the tasks.

You are asked to make three ratings for each task that is part of your job: **Frequency** (how often you do the task), **Importance** (how serious it is if the task is done improperly), and **Difficulty** (how hard it is to do the task properly). If you are not responsible for performing a particular task, just circle "Zero" (Never) for that task. It is anticipated that there may be tasks listed for which you are responsible, but may not have performed (for example, a task which is rarely performed, such as an emergency or abnormal situation). The three rating scales that follow are explained in more detail, and are repeated on the last page of the booklet which should be folded out for easy reference. Please rate these tasks to the best of your ability. Be sure to mark an answer for every task. Please use a pencil in case it is necessary to change a response.

Frequency

In this column you are asked to indicate how often you perform each task. When estimating the frequency of performance, think back over your activities and indicate how often you personally have performed each task by circling the appropriate frequency code number from the scale below:

- 1 = RARELY—Perform once a year or less
- 2 = SELDOM—About three or four times a year
- 3 = OCCASIONALLY—About one time per month
- 4 = OFTEN—About once a week
- 5 = VERY OFTEN—Daily.

Importance

This column asks you to rate the overall importance of each task in terms of the consequences of inadequate performance. You should consider the overall impact with regard to possible unnecessary contamination, damage to equipment and systems, injury to personnel, loss of production capability and possible environmental impact from failure to perform a task properly. Rate task importance using the following guidelines:

Figure 3. Sample survey questionnaire (continued)

- 1 = NEGLIGIBLE—Improper task performance does not result in unnecessary exposure nor does it make any difference in plant operation (no lost production). Neither does it pose any personnel or environmental safety consequences.
- 2 = UNDESIRABLE—Improper task performance may result in a dose considered inconsistent with ALARA or cause some undesirable consequences to plant operation (reduced production capability or some potential environmental impact).
- 3 = SERIOUS—Improper task performance may result in exceeding plant or equipment operating limits, which may require moderate corrective action.
- 4 = SEVERE—Improper task performance may result in equipment damage or personnel injury requiring extensive corrective action.
- 5 = EXTREMELY SEVERE—Improper task performance may result in serious exposure or contamination, implying possible health consequences or plant/equipment consequences that may be enormously time consuming or costly to correct.

Difficulty

This scale is used to rate the difficulty of performing a task in the typical setting or location, rather than in unusual circumstances or in locations rarely encountered. In judging task difficulty, consider the knowledge required to perform the task or the mental activity required. Rate task difficulty using the following scale:

- 1 = VERY EASY—The mental activity required is low, and the degree of task complexity is low.
- 2 = SOMEWHAT EASY—The mental activity required is low, and the degree of task complexity is medium.
- 3 = MODERATELY DIFFICULT—The mental activity required is medium, and the degree of task complexity is medium.
- 4 = VERY DIFFICULT—The mental activity required is medium to high, and the degree of task complexity is high.
- 5 = EXTREMELY DIFFICULT—The mental activity required is medium to high, and the degree of task complexity is very high.

Figure 3. Sample survey questionnaire (continued)

Task Analysis

After analyzing the survey results, the numerical averages of the responses are used to identify which tasks will be selected for training. Tasks are selected or deselected for training using a systematic process. This process involves the establishment of criteria for each category that represents tasks according to their average numeric position on the questionnaire scales. The numeric cutoff points should be based on consideration of the relative impact of the category on the operation concerned. Normally, task importance and task difficulty have a greater impact than task frequency, and the outcome of the decision tree reflects this.

After the criteria developed have been established, the numerical average of each of the tasks is inserted into the decision tree (figure 4) and the proper path is chosen. Tasks should then

be sorted into groups according to similar combinations of average difficulty, importance, and frequency ratings.

The decisions arrived at using this procedure result in a grouping of tasks along a scale so that one end of the scale contains difficult, important, and frequently performed tasks, and the other end of the scale contains the easy, less important, and infrequently performed tasks. Tasks that are identified as no train should be reviewed by subject matter experts and supervisors to ensure that no formal training is needed.

Each group of tasks, in turn, is associated with a recommendation to train, not to train, or to overtrain as follows:

- Train. Provide a combination of formal training (such as classroom instruction, OJT, drills, and simulators).
- No Train. “No Train” is not to be interpreted to mean that no training at all is required. It means that no formal training (refer to Train above) is necessary; the task can be learned on the job.
- Overtrain. Provide a combination of formal training methods plus periodic practice of the task (retraining).

At this point, the train/no train/overtrain lists should be reviewed by a committee. This review is intended to provide concurrence and/or refinement to the list of tasks identified for training. The committee should consist of representatives from training, SMEs, and management since decisions will be made at this point that will determine the amount of time and resources that will be dedicated to subsequent activities.

Selection or deselection of tasks for training should be based primarily on the results of the job analysis. Care should be taken to ensure that training needs are considered and training requirements originating from regulatory sources are included.

Prepare a task-to-training matrix. The purpose of a task-to-training matrix (TTM) is to provide one document that can be used to guide the maintenance of a training program. It provides a ready reference for evaluating the impact of procedure changes, criteria for selecting tasks for training, updated technical information, revised learning objectives, etc. The matrix should contain information for all tasks, whether selected for training or not. All related training and reference material should be included for the tasks selected for training.

Tasks not selected for training should be listed in a separate section of the matrix and should include only related reference material. For new training programs, the matrix should be initiated following collection of job analysis data. As the later phases of the SAT are completed, additional information should be identified for inclusion into the matrix. For existing training programs, the TTM should be completed for all applicable training material (initial and continuing) and related references. This information provides the basis for analysis of existing training materials.

Conduct an analysis of existing training material. At this point in the analysis phase, a comparison of existing training materials should be conducted. This is best accomplished using a committee made up of at least three SMEs and one or two knowledgeable people from the training organization.

Complete the task analysis. Although included in this process for consistency, in actual practice, task analyses, design, and development activities normally occur concurrently for most tasks. As training is designed and developed for the tasks selected for training, each task should be analyzed to determine the knowledge, skills, and abilities required for satisfactory accomplishment of the task. Task analysts should be selected and further trained in the process.

Task analysis data collection forms should be developed to meet specific division/department needs. Task information to be collected includes the following:

- Initial conditions (prerequisites) required for task performance
- Standards (criteria) for acceptable task performance (e.g., limits, ranges, time requirements)
- Critical elements (steps) that must be performed to accomplish the task properly
- Associated knowledge, skill, and ability statements required to perform particular elements of the task or the overall task

Procedures for conditions, standards, and elements associated with a task may be referenced if the information is adequately addressed in the procedure.

Task analysis information may be collected by one or more of the following methods:

- Incumbent/subject matter expert interviews using guidelines or previous task analyses
- In-depth procedural review
- Subject matter expert consensus group meetings

The particular method(s) used will be dependent upon manpower availability, plant production/operation requirements, and budgetary restraints.

When a task is large or complex, compiling key data on some type of analysis form can ensure that the required knowledge and skills are not overlooked.

Documentation collected during task analysis should be retained as part of the training course file and updated periodically as required by procedural changes, equipment/system modifications, management policy changes, and/or job restructuring.

Application of job or task analysis information. Information collected during the analysis is translated into training program requirements. Analysis data are also used to validate training program content and ensure that training reflects actual job requirements for both existing and newly developed material.

Training development/changes. As additional training requirements are identified by user groups, requests for the development of new training materials and/or modifications of existing materials should be made.

Analysis checklist. For ease in tracking activities during the analysis phase, use of a checklist is encouraged. This will allow individuals involved in the process to better plan and coordinate their activities.

Key considerations. The following key considerations should be emphasized when performing and evaluating activities of the analysis process:

- A systematic process involving both training and facility personnel is used to analyze training needs.
- Alternative solutions to performance problems, including training and other management initiatives, are considered thoroughly before committing resources.
- Job performance requirements are identified through reviews of existing job data and/or surveys of workers and are confirmed by subject matter experts.
- Clear standards and uniform methods are used to collect, analyze, and review job and task data.
- A panel of subject matter experts is used to assist training personnel when selecting tasks for analysis and training.
- Tasks are identified for initial and/or continuing training.

Alternative methodology. Analysis provides the core information that is essential in establishing programs that are job related. There are several different types of analyses that have value when applied appropriately to reflect the complexity and risk associated with job performance. Analysis is used in program development, program revision, and program improvement. Analysis is cost-effective in the long term because it ensures that training resources are used effectively (only job-related tasks are identified and included in the training program).

Selecting an analysis technique. Factors specific to analysis that should be considered when selecting an analysis technique include the following:

- Availability of similar task lists
- Availability and accuracy of job-related procedures
- Availability of documented safety analyses
- Quality of existing training materials
- Availability and quality of input from SMEs

If the availability of SMEs is limited, a verification analysis (if a task list is available) or an analysis of procedures and other job-related documents should be conducted. Lacking the aforementioned resources, job analysis should be conducted using either table-top or traditional techniques. In practice, a combination of table-top, verification, and document analysis techniques has generally proven to be most efficient.

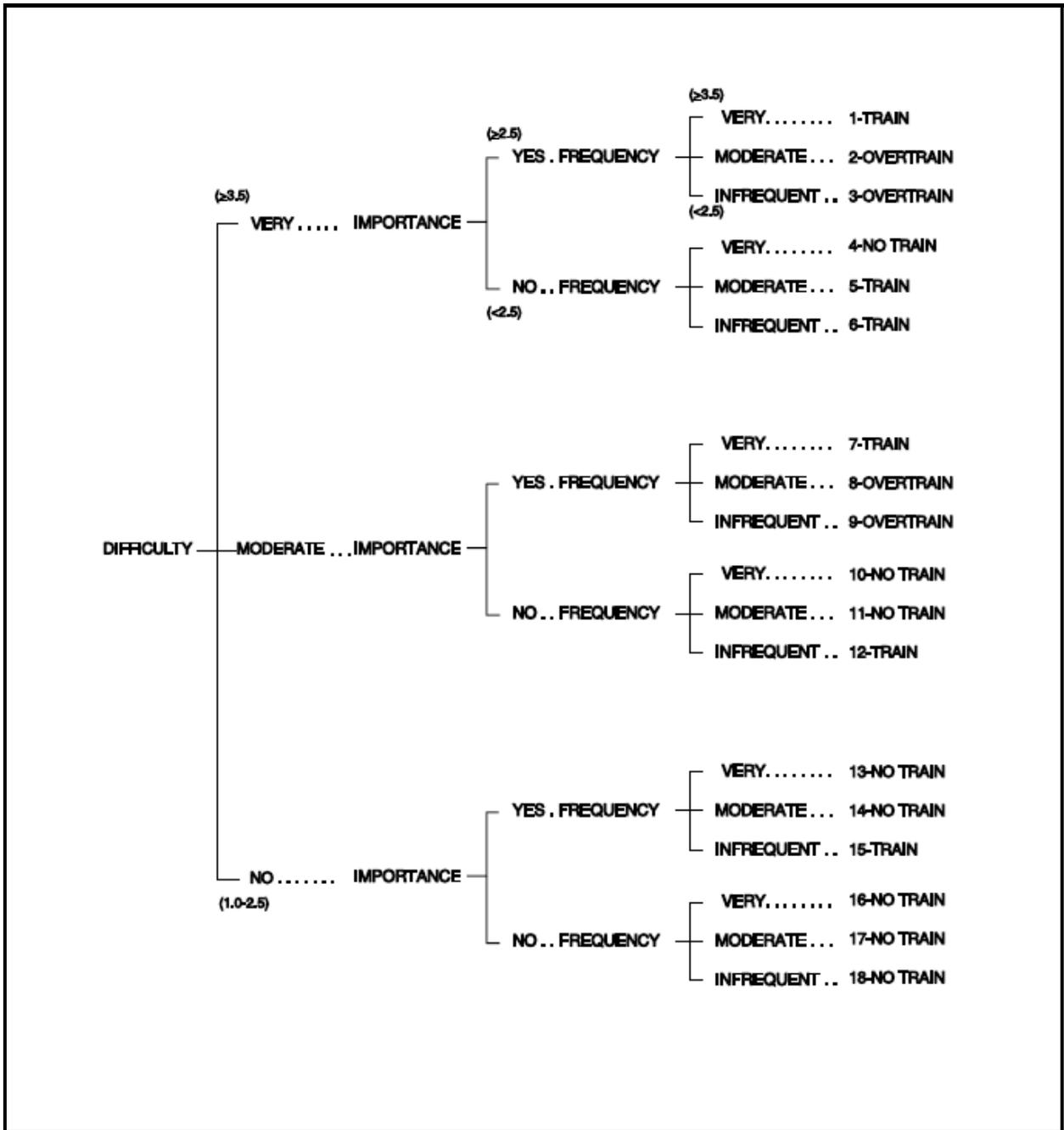


Figure 4. Criteria for Selecting Tasks for Training

- b) Identify a position to be assessed.
- c) Gather appropriate reference and resource materials related to the position.
- d) Interview subject matter expert(s) and supervisors associated with the position to determine the duties and responsibilities in terms of tasks and/or competencies.
- e) Determine the knowledge, skills, and abilities (or specific training) required to support the identified duties and responsibilities.

- f) **Assist employees with the preparation of their individual development plans (IDPs), using the results of job/position and task analyses, and related information.**
- g) **Compile the IDPs and other training needs information into an organizational needs assessment, and prepare a prioritized (according to organizational requirements) listing of annual training and education needs.**
- h) **Research and present the findings to office management of how a developmental need is fulfilled.**
- i) **Validate the results of the needs assessment with other SMEs and/or the responsible supervisor.**

Elements “b” through “i” are performance-based competencies. The qualifying official will evaluate the completion of these competencies.

- 4. **Technical training personnel shall demonstrate a working-level knowledge of training course and/or program design techniques and methodologies.**
 - a) **Using DOE-HDBK-1078-94, Training Program Handbook: A Systematic Approach to Training, section 3 and associated attachments, DOE-HDBK-1074-95, Alternative Systematic Approach to Training, DOE-HDBK-1086-94, Table-Top Training Program Design, describe the following:**
 - **Process for designing training programs (including alternate methods)**
 - **Conditions for using alternate methodologies**
 - **Entry-level requirements and how they influence the training program or course design**

Process for Designing Training Programs

The approach described in the following paragraphs outlines the basic processes used to design training programs that are based on the job-related/performance-based information collected during analysis. This information is divided into the major headings of the design process.

Write terminal objectives. Terminal learning objectives (TLOs) are learning objectives that clearly state the measurable performance the trainee will be able to demonstrate at the conclusion of training, including conditions and standards of performance. They are translated directly from the task statement, and provide the framework for the development of training/evaluation standards, enabling objectives, and lesson plans. Care must be taken when developing and writing learning objectives. Trainees must clearly understand them, or they are of limited use. Related terminal objectives must be written for each task statement before any other design work is begun.

When writing a terminal objective, the training setting must be considered since it must be balanced against available resources and facility constraints. The training setting is the environment in which training is conducted and should be consistent with the task. Training settings include self-paced instruction, OJT training, simulation, laboratory/workshop training, and classroom instruction.

All terminal objectives for tasks identified for inclusion in the training program must now be sequenced and organized into instructional areas. Objectives are normally sequenced from simple to complex. The sequence should allow each terminal objective to build on and provide information necessary to support the next terminal objective within that instructional area. They should be sequenced in a logical progression that takes into account the level of learning that must take place to build to the next objective. This will ensure the entire training program is sequenced correctly.

Develop training/evaluation standards (TESs). After the terminal objectives have been written, it is necessary to ensure that training materials are directly linked to the objectives. The development of a TES can help to ensure that this vital link is maintained. The purpose of the TES is to provide the basis for the development of objective-based training materials and to maintain consistency in the evaluation of student performance. Each TES is directly related to a specific job task (or group of very similar tasks) identified during job analysis.

The following steps are performed when developing the TES:

- Determine testing limitations
- Determine elements of the task to be tested
- Identify knowledge, skills, and abilities (KSAs)
- Determine entry-level requirements
- Determine amplifying conditions and standards
- Write enabling objectives
- Determine scoring methods

Enabling objectives are learning objectives that support the terminal objective. They include the critical components of performance, conditions, and standards. Enabling objectives should be written directly from the KSAs required for element performance. Any identified KSAs that are not included in the entry-level requirements must be incorporated into an enabling objective.

Enabling objectives should be sequenced logically, moving from simple to complex and from lower to higher levels of learning. Often, the required sequence will drive the outline and content of the lesson plan and other training material. If TESs are developed for all tasks identified for a particular training program, enabling objectives that are common to several tasks may be grouped into one lesson of instruction. This grouping can increase the efficiency and cost effectiveness of a training program by reducing duplication. For this reason, a computerized system that can sort by enabling objective title can be invaluable.

Scoring methods are determined when constructing the evaluation section of the TES. In some evaluation standards, referenced procedures may provide detailed, step-by-step descriptions of required performance, and therefore provide an effective scoring method.

Another method is to prepare a performance checklist that incorporates the action steps or elements of task performance. The trainee is required to follow each step, usually without deviation. When developing the TES, items that can be scored must be clearly defined to distinguish between satisfactory and unsatisfactory performance.

Develop test items. Test items are developed to be consistent with the learning objectives. The purpose of the test item is to measure trainee performance against the criteria stated in the learning objective. The test item development sequence is as follows:

- Determine test item format
- Determine the number of test items to be developed
- Develop skill and knowledge test items
- Validate content of test items
- Incorporate items into test bank for future use

Construct tests. The construction of tests at this time is optional. However, tests must be constructed prior to implementing the training program. Tests are a form of evaluation that instructors can use to measure the results or effectiveness of their stated objectives. Test items should be constructed and scored in an objective, rather than subjective, manner. An objective test can be scored without the exercise of personal opinion. The length of a test should not exceed the number of test items which could be answered in two hours by the average trainee. This may require assembling several tests for a given instructional area. The following steps are involved in the development of tests:

- Develop test specifications
- Assemble the test

Write a training development and administrative guide. A training development and administrative guide should not be confused with the facility's training management manual that outlines the facility training policies and procedures that guide the development of all training. A training development and administrative guide is a management tool for the administration of an individual training program. It is used to gain management approval of the program and guide development and implementation efforts. Though not part of this guide, additional specifications may be developed to clarify and detail the required characteristics of individual courses or lessons. Approval should include training management and the management of the organization for which the training is being developed.

Alternate design. An alternate, table-top approach to design is used to determine and design the content of a training program. The table-top method typically involves the following steps:

- Developing a curriculum outline
- Determining the content of each training session and writing learning objectives, and determining the appropriate learning strategy (instructional method and setting)
- Determining testing requirements

The table-top training program design handbook, DOE-HDBK-1086-95, contains detailed guidance on the table-top method for designing training materials and programs.

Conditions for Using Alternate Methodologies

Using alternatives to the more traditional methods of establishing systematic training programs can significantly reduce the time and effort associated with the training process. Alternative approaches streamline analysis, design, development, implementation, and evaluation of training materials and programs. Alternative delivery mechanisms such as structured self-study, computer-based training (CBT), or interactive video/multi-media should also be considered where appropriate.

Techniques range from very simple to elaborate. The least elaborate techniques are typically used for the training of managers, the technical staff, and oversight personnel. For these positions, the training process may only require (1) an evaluation of the job to determine significant job requirements, (2) an evaluation of the education, experience, and prior training of job incumbents to identify deficiencies between job requirements and the individual's current qualifications, and (3) implementation of a plan for the individual to correct the identified deficiencies. The plan may include temporary rotational job assignments; mentoring; required reading; attendance at workshops, seminars, and professional society meetings; and training on specific areas that are applicable to the job requirements.

More elaborate techniques, typically necessary for higher risk jobs such as fissile material handlers, reactor operators, and senior reactor operators, would normally involve some form of job and task analysis followed by development of detailed learning objectives, lesson plans, job performance measures, etc.

Regardless of the techniques used, a strong evaluation process is necessary to ensure effective implementation, timely updates, and periodic improvements.

Entry-Level Requirements and How They Influence the Training Program or Course Design

In every training program, the entry-level KSAs of the trainee must be considered. By properly establishing the entry-level requirements, new learning will be based on what the trainees already know, and the trainees will not be wasting time on objectives they have already mastered.

The entry-level requirements should be based on a familiarity with the general level of KSAs of the trainees, and by a careful review of documents such as job descriptions, position descriptions, or personnel qualification requirements. The entry-level requirement should be set at a point where most trainees have the required KSAs. Any required KSAs that the trainees do not possess upon entry will have to be taught as part of the overall training program. Remedial lessons may be necessary for those trainees who do not meet the entry-level requirements.

One way to determine the entry level is to develop and administer an entry-level test. This test can determine if personnel meet the entry-level requirements, and serves to focus the training at the appropriate level. This can be especially helpful when evaluating an existing program since it allows comparison of the existing job incumbent training level to the desired level. It should be noted that entry-level testing is optional and can be affected by contractual agreement. It is essential, however, that a system be in place to enable verification that trainees meet the established entry-level requirements. The system should include a course of action for those personnel who fail to meet the requirements.

b) Using DOE-HDBK-1200-97, Guide to Good Practices for Developing Learning Objectives, describe the process for developing learning objectives stressing the following:

- **Development and validation of learning objectives**
- **Differences between terminal and enabling learning objectives**
- **Attributes of well-written objectives**
- **Grouping and sequencing of learning objectives**

Development and Validation of Learning Objectives

The development of effective training materials is dependent on the development of learning objectives which adhere to a strict set of criteria. Learning objectives are developed from analysis information obtained during the design phase of the SAT process. It is important that objectives are developed and approved early since they form the foundation for the development of test items and all other training material.

Because objectives serve as the design basis of performance-based training programs, they should clearly describe the trainee's desired performance to preclude misinterpretation.

Some of the benefits of using learning objectives are listed below:

- Standards of performance are presented in a trainee-accessible way.
- Criteria for evaluation are defined.
- Learning requirements are clarified and explicit.
- Content, methods, media, and resources are derived and related to objectives.
- Focus is provided for the instructor and the trainee.

Differences between Terminal and Enabling Learning Objectives

See element "a" of this competency for a description of terminal and enabling learning objectives.

Attributes of Well-Written Objectives

All effective learning objectives have certain characteristics. The developer should always take the following characteristics into consideration when constructing objectives.

- **Attainable:** Is the objective possible to achieve by the average trainee?
- **Specific:** Is the wording concise? Has unnecessary and confusing verbiage been removed?
- **Clear:** Will everyone interpret the objective in the same way?
- **Measurable:** Can this behavior be measured? How? With what kind of gauge?

Effective learning objectives can be stated in a variety of formats. The most common format combines condition, action, and standard statements. This combination explicitly defines the condition under which the performance occurs, what knowledge or skill is exhibited, and the standards of acceptable performance.

Condition statement. The condition statement establishes the circumstances under which the trainee must be able to perform the specified action. Conditions are derived from information collected during analysis of the task. They also include equipment, tools, and references necessary to perform the task.

Condition statements can generally be considered as either aiding or limiting. An aiding condition advises the trainee of things that will be available to assist in performance of the specified action. A limiting condition advises the trainee of limitations which are likely to make the action more difficult to perform.

Action statement. The action statement is the nucleus of the objective and should therefore describe exactly the performance required of the trainee on the job. It should be precise, observable, and should be based on the task, element, skill, or knowledge statements resulting from the analysis of the task. The action statement consists of an implied subject (you), a verb, and the verb's object.

Standard statement. The standard statement describes what criteria must be met for the performance specified by the action statement to be considered acceptable. The standard for the objective should be derived from the standard required by the task. The developer of learning objectives must always remember to strive for standard statements that closely approximate actual performance criteria. The standard will refer to the quality of the end product or the precision of the process and is usually expressed in terms of time limits, accuracy, quality, or quantity.

Grouping and Sequencing of Learning Objectives

See element “a” of this competency for a discussion of grouping and sequencing learning objectives.

c) Describe and differentiate the design features for the various training settings (including technology-supported learning) that may be selected when designing a training curriculum.

Training settings include self-paced instruction, on-the-job training, simulator training, laboratory/workshop training, and classroom instruction.

Self-Paced Instruction

Self-paced instruction is any form of instruction that does not require the presence of an instructor at the training setting. However, feedback must be provided. Self-paced instruction can be in printed form, in audiovisual form, in the form of a kit that can be assembled or manipulated, or in the form of a computer-assisted instruction program.

Training that meets the following conditions can be considered for self-paced instruction:

- Training for the task does not require close supervision. Unsupervised training is not likely to result in injury to employees or damage to plant equipment. In addition, immediate feedback from a supervisor is not required for the trainee to achieve mastery.
- New personnel are not required to perform the tasks immediately.
- All conditions can either be provided in the training materials or made available in the facility when needed by the trainee. Tasks that require special facilities, conditions, or equipment not readily available in the facility should be considered for another training setting.
- The task does not require extended periods to achieve mastery. Tasks that are very difficult or extremely difficult suggest lengthy training durations and are more suited to settings that provide supervision and immediate feedback.

On-the-Job Training (OJT)

OJT is formal training that is conducted and evaluated in the work environment. If the job permits the assignment of tasks to OJT, and a system is in place to handle the administration and testing involved in OJT, tasks can be considered for assignment to this setting. OJT has the advantage of providing continuous training on tasks that are of immediate need to the trainee. Further, OJT can continue for whatever length of time is necessary for the trainee to achieve mastery.

OJT is limited to those situations where it is administratively possible to conduct the training and where OJT can be conducted without interference to ongoing facility operations.

Training that meets the following conditions can be considered for OJT:

- Assignment of trainees can be made in small groups and spread over a sufficiently long period of time.
- There are no critical resource (manpower, material, facility availability) constraints in the plant, and multiple training conditions can be provided in the job environment.
- Qualified personnel are available to conduct OJT.

Simulator Training

Simulator training is training that is conducted in or on a device that duplicates the work environment in the physical appearance; operating conditions during normal, abnormal, and emergency conditions; and indications associated with the actual work environment. This setting, though expensive, is suited for training tasks requiring a high degree of trainee-system interaction, but for which OJT is not appropriate. For example, some of these tasks are performed infrequently and would not be encountered normally in the course of OJT.

Tasks that meet the following conditions can be considered for simulator training:

- Similarity to the actual task is required for the trainee to achieve mastery.
- Problem diagnosis under stressful situations is an integral part of performance.
- Teamwork is an important part of the task.
- Training of the tasks in the OJT setting would interfere with ongoing facility operations, would introduce unnecessary safety hazards, or would not be encountered in the course of normal job operations.
- A simulator exists or can be obtained that sufficiently resembles the physical and operational characteristics of the facility.
- The physical performance skills and system interaction components of the tasks are sufficiently great to require a fair amount of repetitious practice.

Laboratory/Workshop Training

Laboratory/workshop training is training that emphasizes hands-on, practical experience in a controlled environment, but which is not necessarily conducted at the actual job site.

Laboratory/workshop training should be considered if multiple job conditions (environment, system, equipment, etc.) are required for task performance. Laboratories and workshops permit application of course material by the trainees in a hands-on environment. They are particularly effective when used to train basic skills that support task performance. Training that meets the following conditions can be considered for laboratory/workshop instruction:

- Tasks, elements, and skills require hands-on practice to achieve mastery.
- Constraints exist that make OJT impractical.

Classroom Instruction

Classroom instruction is training presented to groups of various sizes, typified by stand-up lecture, seminar, or group interaction. Classroom instruction works well for presentation of fundamental and basic theoretical knowledge. Because a classroom training setting does not replicate OJT conditions, it is recommended that a combination of classroom and other settings be used in the course of instruction. Training that meets the following conditions can be considered for classroom training:

- Large quantities of information will be presented during training.
- A large group of trainees will be scheduled for training at a given time.
- Other training settings are not suitable or available.

- There are no critical resource constraints. (Everything required for training can be provided at the classroom facility.)

When evaluating the design of an existing training program or addressing a performance deficiency, determine if the current training setting for the task is the best instructional choice. If it is not, it may be necessary to select another training setting and/or modify the learning objectives and lesson material to incorporate the setting selected. For new programs, evaluate each setting and select the setting most consistent with the task, taking into account available resources and facility constraints. Write the terminal objective based on the task and the setting.

d) Prepare the learning objectives and identify the corresponding media, method, or setting for an assigned training program or course.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

5. Technical training personnel shall demonstrate a working-level knowledge of the process, techniques, and methodology associated with training material development.

a) Explain why formal and documented training materials are necessary in a formal, systematic approach to the training process.

Training support materials refer to training equipment, audiovisual media, and printed material. When selecting or developing training support materials, the type of material is influenced by the learning objectives and method of instruction. Materials should support the learning objectives and emphasize job-related information and situations. The lesson specifies what training materials are required and when. The following steps are performed when developing training materials.

Specify Use of Audiovisual Media

The use of audiovisual media in presenting course material can help maintain trainee interest and motivation, and can improve training efficiency and effectiveness. Media to be considered include simulation, computer-aided instruction, film or videotape, sound slide or film strip, audio recorder, transparencies, and written handouts.

The characteristics of a learning activity may suggest that a medium with certain audiovisual capabilities will be more effective in displaying or transmitting the desired information to the trainees. These characteristics are visual, visual movement, exact scale, and audio. Each learning activity must be analyzed to determine which of the characteristics should be reflected in the audiovisual capabilities of the medium. These four characteristics are not independent, and combinations of them may be needed to display or transmit the information effectively. The media selected should be evaluated in terms of cost and practicality of use in the training program. Factors to be considered in these evaluations include the following:

- Projected life-cycle costs of the selected media
- Budgetary resources available, particularly if the media requires a substantial capital investment
- Appropriateness of the media for the number of trainees to be trained at a given time

- Frequency of changes to media
- Compatibility with existing programs
- Lead time required to produce the media

Review and Select from Existing Materials

Developing effective training materials requires creativity and is both costly and time-consuming. Adopting or modifying existing materials can reduce training development costs. Existing course materials should be collected and reviewed to determine if they meet, in whole or in part, the needs of the training program. Material selection should be based on an evaluation of existing materials against the following criteria:

- Is it appropriate to expected trainee entry-level skills and knowledge?
- Does it cover the learning objectives?
- Is it consistent with learning activities?
- Is it compatible with the training development and administration guide for the program?

The review and analysis of existing course materials will identify materials to be rejected, materials to be accepted without revision, and materials to be revised. The materials that are suitable without revision should be incorporated into the development process.

Modify Existing Training Materials

Modifying existing training materials can minimize development time and conserve resources. The modification process can involve two approaches: revision of existing training materials that are free of copyright restrictions, or preparation of supplementary material for training materials under copyright restrictions. Modification should be considered when existing materials are incomplete or minor changes are needed, as in the following examples:

- Additional information is needed to meet the requirements of the learning objectives and learning activities.
- Minor modifications to facility systems, equipment, and/or procedures require an update or change.
- Minor changes in regulations require an update or change.
- Industry operating and maintenance experiences necessitate a minor update or change.

Existing materials that are incomplete or require minor modification should be modified using the following guidelines:

- The style and reading level of the modification should be consistent with the existing materials.
- Modifications should be inserted into existing material where needed.
- Some redundancy may be necessary to provide continuity between the modifications and the existing materials.

Develop New Materials

Development of new training materials should be consistent with the learning objectives and should reflect the learning activities to ensure that the trainees progress through training in an organized and efficient manner. Training materials should be developed using guidelines that are intended to promote learning. The guidelines include formatting that will ensure

ease in trainee use. For example, charts, graphs, tables, and other illustrations that are effective in emphasizing key points should be located on a separate page and in close proximity to related information. The reading level of training materials should be consistent with the expected entry-level skills and knowledge of the trainees. Essential information should be located in the materials, and the trainees should not be referred to other places for that information. More than one representation of key or complex information should be included in the materials. Relating the information in a job context is an effective way to promote learning. This should include a description of the job environment, how the information will be applied on the job, and the reasons why it is important for the trainee to learn the information.

b) Explain the relationship between learning objectives, training materials, and the presentation of instruction.

The development of effective training materials is dependent on the development of learning objectives which adhere to a strict set of criteria. Learning objectives are developed from analysis information obtained during the design phase of the SAT process. It is important that objectives are developed and approved early since they form the foundation for the development of test items and all other training material.

When writing a learning objective, the presentation of instruction must be considered since it must be balanced against available resources and facility constraints. The presentation of instruction is the environment in which training is conducted and should be consistent with the task.

c) Using DOE-HDBK-1078-94, describe the attributes, content, and format of available training methods.

See competency “4c” for a discussion of training methods.

d) Using DOE-HDBK-1078-94, describe the attributes, content, and format of lesson plans.

Lesson Plan Attributes and Content

Lesson plans are detailed expansions of the curriculum outline that ensure consistency in the delivery of training from instructor to instructor and from student to student. They are used by the instructor as the primary training tool to guide the learning process and utilization of training materials. Lesson plans identify the learning objectives, content, learning activities, training equipment, and training materials needed for training and provide guidance for their use. In addition, properly developed lesson plans perform the following functions:

- Provide a degree of standardization of instruction
- Present a logical, sequential listing of content
- Prevent over- as well as under-emphasis of selected content
- Force instructors to analyze content prior to presentation
- Offer a ready format for revision
- Provide a record of contents presented
- List aids, equipment, and references used
- Provide continuity between the lessons presented within a specific course, especially when several instructors are involved

Lesson Plan Format

The first step in lesson plan development is the determination of format. Instructor and trainee activities should be planned so they occur at the proper stages in the learning process. Once a standard format has been established, it should be used for all lesson plans. This standard format should be specified in the facility training management manual. While the printed design or format of a lesson plan may differ, the lesson plan should include the following:

- Cover page
 - Labeling information
 - Course title and number — a title and a number unique to that lesson plan
 - Lesson title — a title descriptive of the content
 - Lesson time — approximate duration of the lesson
 - Author — name of individual who wrote or last revised the lesson plan
 - Review and approval signatures
 - Date — date lesson plan was approved or last revised
 - Revision number — current revision number
 - Terminal and enabling objectives — the learning objectives for the lesson
 - Training aids and material used — a list of all support material and tests used during instruction with this lesson plan
 - References — all pertinent references used to support the content of the lesson plan (inclusion of page and paragraph for text material is helpful)
 - Prerequisites — any courses, classes, qualifications, etc., required prior to beginning this instruction
- Historical record form
 - A section which includes documentation of the changes made to a lesson plan, why they were made, and who made and approved them
- Presentation content
 - Introduction — a section which includes the purpose of the lesson, the training session conduct and administration (i.e., breaks, smoking policy, outline of activities), and a statement of the learning objectives
 - Body — the lesson content and trainee and instructor activities
 - Summary — a highlight of important points and review of learning objectives

e) Using DOE-HDBK-1078-94, describe the attributes, content, format, and selection of training support material.

Training support materials refer to training equipment, audiovisual media, and printed material. When selecting or developing training support materials, the type of material is influenced by the learning objectives and method of instruction. Materials should support the learning objectives and emphasize job-related information and situations. The lesson specifies what training materials are required and when. Additional information about training support material is available in element “a” of this competency.

f) Describe the advantages and disadvantages of traditional and nontraditional (such as technology-supported learning) delivery systems, associated materials and media, and such issues as cost and scheduling.

Information related to delivery systems, associated materials, and media are available in element “a” of this competency.

Training schedules should maximize learning effectiveness and result in the efficient use of instructors, facilities, and equipment. Training also should be scheduled to minimize the impact on line organization activities. Instructor selection and training assignments should be included in the scheduling process. Instructor assignments should be made on the basis of selecting those with the most appropriate technical competence and instructional capabilities. Variation in instructional assignments should be considered to develop the instructor's skills and knowledge.

Training schedules and instructor assignments should be established and published far enough in advance to permit instructor planning, technical and administrative preparation, and material preparation. Training schedules should also be published sufficiently in advance to permit adequate preparation and planning by trainees and their supervisors. Schedules should include time for test preparation and correction, subsequent trainee review, record keeping, trainee assistance and remediation, and self-study. Schedules should also be flexible to permit adding or changing content or repeating selected portions based on trainee performance.

- g) Using the results of a training needs assessment or job analysis, develop a course outline, learning objectives, and a lesson plan to reflect the required knowledge and skills.**
- h) Develop training materials to support the presentation of an assigned classroom, self-study, or laboratory training session.**

Elements "g" and "h" are performance-based competencies. The qualifying official will evaluate the completion of these competencies.

- i) Describe the methods used to validate training prior to implementation.**

Before it can be validated, the training program should be conducted or tried out to see if it does what it is intended to do. There are two ways to try it out: SME validation and trainee validation. These validation methods are further described below.

SME validation. Determining who should participate in validating the training depends on who the training is for. Have co-workers sit through the training session. Observe training and see where problems occur or where training can be improved. See how the information is perceived by the trainees. Determine whether the SMEs will have problems understanding what is said, or whether they can perform the procedures based on what they are told. If the SMEs have a problem with the training, it is likely the trainees will also have a problem. This evaluation only points out where the problems may occur. The real test is with the trainees themselves, and often the trainees identify different problems than those identified by the SMEs.

Trainee validation. For this type of validation, use the actual trainees who need the course. The test group should know where problems exist and where improvements can be made in the training. Remember, the training session is for the trainees, not the trainer. They need to learn the material to be able to perform the job. The better the material is, the more they will learn.

6. Technical training personnel shall demonstrate a working-level knowledge of adult learning methodologies, instructional media and methods, and instructor techniques required to conduct a training session or evaluate the effectiveness of training sessions.

a) State and discuss the factors that an instructor can control that affect learning during classroom instruction, including a discussion of dealing with difficult trainees.

The following table lists nine behaviors exhibited by difficult trainees and a set of possible responses for each behavior.

Behavior	Possible Responses
Rambling, wandering around, getting off the subject, using far-fetched examples or analogies	<ul style="list-style-type: none"> ▪ Refocus attention by restating relevant points. ▪ Direct questions to the group that focus back on the subject. ▪ Ask the trainee how his/her topic relates to the current topic being discussed. ▪ Use visual aids, begin to write on the board, or turn on the overhead projector. ▪ Ask: "Would you summarize your main point please?" or "Are you asking...?"
Shyness, silence, or lack of participation	<ul style="list-style-type: none"> ▪ Change teaching strategies from group discussion to individual written exercises or a videotape. ▪ Give strong positive reinforcement for any contribution. ▪ Involve the trainee by directly asking him/her a question. ▪ Make eye contact. ▪ Appoint the trainee to be a small-group leader.
Talkativeness, knowing everything, manipulative behavior, or chronic whining	<ul style="list-style-type: none"> ▪ Acknowledge comments made. ▪ Give limited time to express viewpoints or feelings, and then move on. ▪ Make eye contact with another participant and move toward that person. ▪ Give the person individual attention during breaks. ▪ Say: "That is an interesting point. Now let's see what other people think."
Sharp shooting, trying to shoot you down or trip you up	<ul style="list-style-type: none"> ▪ Admit that you do not know the answer and redirect the question to the group or to the individual who asked it. ▪ Acknowledge that this is a joint learning experience. ▪ Ignore the behavior.
Heckling/arguing, disagreeing with everything you say, or making personal attacks	<ul style="list-style-type: none"> ▪ Redirect questions to the group or to supportive individuals. ▪ Recognize the participant's feelings and move on. ▪ Acknowledge positive points. ▪ Say: "I appreciate your comments, but I'd like to hear from others," or "It looks like we disagree."
Grandstanding, getting caught up in one's own agenda or thoughts to the detriment of other learners	<ul style="list-style-type: none"> ▪ Say: "You are entitled to your opinions, beliefs, or feelings, but now it's time we moved on to the next subject," or "Can you restate that as a question?" or "We'd like to hear more about that if there is time after the presentation."

Behavior	Possible Responses
Overt hostility/ resistance, angry, belligerent, or combative behavior	<ul style="list-style-type: none"> ▪ Hostility can be a mask for fear. Reframe hostility as fear to depersonalize it. ▪ Respond to fear, not hostility. ▪ Remain calm and polite. Keep your temper in check. ▪ Don't disagree, but build on or around what has been said. ▪ Move closer to the hostile person and maintain eye contact. ▪ Always allow him/her a way to gracefully retreat from the confrontation. ▪ Say: "You seem really angry. Does anyone else feel this way?" ▪ Solicit peer pressure. ▪ Do not accept the premise or underlying assumption if it is false or prejudicial, e.g., "If by queer you mean homosexual..." ▪ Allow the individual to solve the problem being addressed. He/she may not be able to offer solutions and will sometimes undermine his/her own position. ▪ Ignore the behavior. ▪ Talk to him or her privately during a break. ▪ As a last resort, privately ask the individual to leave class for the good of the group.
Griping and possibly legitimate complaining	<ul style="list-style-type: none"> ▪ Point out that we can't change policy here. ▪ Validate his/her point. ▪ Indicate you'll discuss the problem with the participant privately. ▪ Indicate time pressure.
Side conversations, whether related to the subject or personal	<ul style="list-style-type: none"> ▪ Don't embarrass talkers. ▪ Ask their opinion on the topic being discussed. ▪ Ask talkers if they would like to share their ideas. ▪ Casually move toward those talking. ▪ Make eye contact with them. ▪ Comment on the group (but don't look at them one-at-a-time). ▪ Standing near the talkers, ask a near-by participant a question so that the new discussion is near the talkers. ▪ As a last resort, stop and wait.

b) Describe the attributes of an effective classroom learning environment.

Learning environments should emphasize the following attributes:

- Active
- Constructive
- Collaborative
- Intentional
- Complex
- Contextual
- Conversational
- Reflective

Following is a brief description of what these attributes entail.

Active

Learners are engaged by the learning process in mindful processing of information where they are responsible for the result. In natural learning situations, learners and performers of all ages, without the intervention of formal instruction, can acquire sophisticated skills and advanced knowledge about what they are learning. For instance, before playing sandlot baseball, do kids subject themselves to lectures and multiple choice examinations about the theory of games, the aerodynamics of orbs, and vector forces. No! They start swinging the bat and chasing fly balls, and they negotiate the rules as they play the game. Through formal and informal apprenticeships and communities and play and work, learners develop skills and knowledge that they then share with other members of those communities with whom they learned and practiced those skills. In all of these situations, learners are actively manipulating the objects and tools of the trade and learning by reflecting on what they have done.

Constructive

Learners integrate new ideas with prior knowledge to make sense of the ideas or to reconcile a discrepancy, curiosity, or puzzlement. They construct their own meaning for different phenomena. The models that they build to explain things are simple and unsophisticated at first, but with experience, support, and reflection, they become increasingly complex. Learners usually do not know what the teacher knows. They can only know what they know, so they should be supported in the process of coming to know.

Collaborative

Learners naturally work in learning and knowledge building communities, taking advantage of each others skills while providing social support and modeling and observing the contributions of each member. Humans naturally seek out others to help them to solve problems and perform tasks. Why then do we insist that learners do their own work, and if they don't, we accuse them of cheating? Individualized, reproductive methods of instruction cheat learners out of more natural and productive modes of thinking.

Intentional

All human behavior is goal directed. That is, everything that we do is intended to fulfill some goal. That goal may be simple, like satiating hunger or getting more comfortable, or it may be more complex, like developing new career skills. When learners are actively and willfully trying to achieve a cognitive goal, they think and learn more. Learning environments need to support learners in articulating what their goals are in any learning situation.

Complex

The greatest intellectual sin that instructors commit is to oversimplify most ideas to make them more easily transmittable to learners. In addition to stripping ideas out of their normal contexts, we distill ideas to their simplest forms so that trainees will more readily learn them. But what are they learning — that the world is a reliable and simple place? Such oversimplification is wrong because problems consist of multiple components and multiple perspectives and cannot be solved in predictable ways like the canned problems at the end of textbook chapters. Instructors need to engage trainees in solving complex and ill-structured problems as well as simple problems. Unless learners are required to engage in higher order thinking, they will develop oversimplified views of their world.

Contextual

A great deal of recent research has shown that learning tasks that are situated in meaningful, real work, or that are simulated in case-based or problem-based learning environments, are not only better understood, but also are more consistently transferred to new situations. Rather than abstracting ideas in rules that are memorized and then applied to other canned problems, instructors need to teach knowledge and skills in real life, providing new and useful contexts for learners to practice using those ideas.

Conversational

Learning is inherently a social, dialogical process. That is, given a problem or task, people naturally seek out opinions and ideas from others. Technologies can support this conversational process by connecting learners across town or across the world. When learners become part of knowledge building communities both in and out of a classroom, they learn that there are multiple ways of viewing the world and multiple solutions to most problems.

Reflective

Learners should be required by technology-based learning to articulate what they are doing, the decisions they make, the strategies they use, and the answers that they find. When they articulate what they have learned and reflect on the processes and decisions that were entailed, they understand more and are better able to use the knowledge that they have constructed in new situations.

c) Compare and contrast various classroom instructional methodologies, including lecture, role-play, case studies, discussions, and practical classroom demonstrations.

Training programs may be delivered in several ways, including classroom lecture, seminar, discussion, case study, satellite delivery, interactive-video or computer-based training, individual self-study, laboratory or simulator instruction, and OJT observation and supervised practice. The instructional method(s) for a particular training program should be selected based on the type of learning involved and the level of proficiency required.

All necessary training materials should be developed and approved before training is conducted. Training materials promote consistency in training by specifying the method of instruction, learning objectives, schedule and sequence of instruction, and evaluation methods and standards. However, training content may be modified to meet the specific needs and limitations of each class. Policies should be established and control exercised to ensure that training materials are used in a uniform manner by instructors, and that all changes are approved by training supervision or through a defined review process.

Classroom Instruction

For classroom instruction, lectures should alternate with demonstrations, discussions, seminars, study sessions, and trainee practice of the material being learned. Training aids should be used to enhance trainee interest. When films and videotapes are used, an instructor should be available to emphasize important points and answer questions. Films and videotapes may supplement, but should not replace, live instruction. Trainees should be

encouraged to participate actively in discussions and to ask questions. Lesson assignments should reinforce the desired learning and allow for practice to develop required skills. All written assignments should be corrected and returned promptly to the trainees to derive the maximum benefit. Regular attendance at classroom instruction sessions and proper behavior (punctuality, attentiveness, and performance of assignments) should be required. All missed training sessions should be made up through appropriate study and evaluation.

Laboratory and Simulator Instruction

Laboratory and simulator instruction and facility drills and walkthroughs should be preceded by lecture or discussion designed to prepare trainees to derive the maximum benefit from the practical experience. Training aids may be used and personnel encouraged to actively participate and to ask questions. Laboratory and simulator exercises should be structured to provide consistent and repeatable training. Exercises should also be designed to maximize the development and maintenance of necessary job-related knowledge and skills.

Case Studies

The case-study approach has been used effectively in learning from facility and industry experiences. The case-study teaching method promotes the generation of ideas and solutions by the trainees rather than memorization of responses provided by lectures. This method gives trainees an appreciation of events that have actually occurred. Many different case-study methods and settings can be used to enhance diagnostic, communication, and team skills by allowing personnel to apply what they have previously learned to new situations.

On-the-Job Training

On-the-job training should consist of a systematic process where a trainee observes and practices facility activities. This training should be administered by the trainee's supervisor or another fully qualified individual using training guides that specify the activity and standard of acceptable performance. Qualified individuals should be designated to conduct OJT evaluations and verify satisfactory demonstration of job performance and knowledge requirements by personnel. A schedule should be established for completion of specified portions of this training, and individual qualification progress should be monitored. Individuals, instructors, and evaluators should be alert to and take advantage of unexpected on-the job training and task performance evaluation opportunities as they occur.

d) Describe the attributes of an effective classroom instructor, including use of training and media materials, effective speaking, questioning techniques, and subject matter expertise.

Qualification requirements should be established and documented for all facility and subcontract personnel, including occasional/casual instructors who perform training activities. (An occasional or casual trainer is an individual who only instructs several times a year; training is not a part of his/her job description.) These requirements should be based on instructor qualification levels, and should address instructional competence, technical competence, and applicable interpersonal skills. All subcontract instructors, both short-term and long-term, should meet the qualification requirements for the subjects they teach and/or develop.

Instructor trainees who are not fully qualified, as well as occasional instructors, should have limited participation in instructional activities. These individuals should perform assignments under the direct supervision of a qualified instructor or a training supervisor. All instructor trainees who are assigned instructional activities should be formally evaluated by a qualified instructor or a training supervisor.

On a case-by-case basis, determined by testing or experience, an instructor trainee may be granted an exception to specific training program requirements. If an instructor trainee can demonstrate mastery of some/all of the course learning objectives prior to the training, an exception is warranted. Administrative procedures should be developed that allow training management the option of releasing such an individual from portions of a qualification.

Instructional Competencies

A job analysis for a DOE facility's instructors and instructional technologists is not required. However, it is recommended that each facility analyze its work activities to ensure that training-related tasks and their associated knowledge and skills are identified and documented for each instructor qualification level. Analysis results should be compared to the facility's instructor training programs to verify that required knowledge (at the proper cognitive level) and skills are provided in the content of each program. Further, these analyses should be used to establish entry-level requirements (education, training, and work experience) for each instructional qualification level.

The knowledge and skills developed by the facility's instructor training programs should also be compared with the representative instructional competencies. This comparison should help to verify the adequacy of, or identify deficiencies in, the facility's analyses and should also identify generic competencies that may not be needed in facility-specific training programs.

Competencies that are identified as applicable to a specific instructor training program should be written in the form of terminal and enabling learning objectives. In all cases, programs should be in place to develop the specific knowledge and skills required for each instructor's qualification level. It is recommended that if a facility does not conduct its own analysis of training-related activities, the content of its instructor training programs should be initially based on DOE-STD-1001-96 and subsequently refined using a systematic evaluation process.

Technical Competencies

Training staff that perform as instructors in the development, presentation, or evaluation of technical topics should possess technical qualifications consistent with their assignments. Technical qualifications should include theoretical and practical knowledge as well as practical work experience at or above the level that is required of the trainee population. Instructors who initially lack practical work experience should complete portions of operator/technician/craft training programs related to the topics taught. These instructors should thoroughly understand the subject matter and its relationship to overall facility operation.

Each facility should establish written procedures that stipulate what these technical qualifications will be, to whom they apply, and how they may be attained for each instructor qualification level.

Interpersonal Skills

The ability to provide effective training is significantly influenced by the interpersonal skills of the instructor. Interpersonal skills (sometimes referred to as soft skills) needed by instructors may be identified through observations or interviews with skilled instructors. Trainee feedback on instructor style and delivery (which is usually highly subjective) may also provide insight to desirable interpersonal skills. Many of these skills are contained in managerial training courses. It is important that these skills are identified and included in the instructor training programs.

The instructor has a pivotal role in affecting the quality of training. The instructor's communication skills can significantly impact instructional effectiveness. Instructors should possess strong listening and speaking skills. Other skills include the ability to listen to questions, to phrase questions that stimulate thought, and to deal effectively with conflict.

The ability to influence trainee behavior is closely related to the instructor's motivational skills and personal example. The demeanor of the instructor is as important to the quality of the instruction as the lesson content and materials. Since trainees tend to model their actions after instructors, it is essential that instructors demonstrate leadership qualities, convey a positive attitude toward training, and promote professionalism in the work environment. Use of these interpersonal skills is the mark of an effective instructor.

- e) Conduct a classroom training session or make a formal presentation to a group of personnel.**
- f) Prepare and administer a technology-based training program.**

Elements "e" and "f" are performance-based competencies. The qualifying official will evaluate the completion of these competencies.

7. Technical training personnel shall demonstrate a working-level knowledge of OJT techniques, methodology, and implementation and apply that knowledge to implement and/or evaluate OJT programs in the field.

- a) Using DOE-HDBK-1206-98, Guide to Good Practices for On-the-Job Training and DOE-HDBK-1205-97, Guide to Good Practices for the Design, Development, and Implementation of Examinations, describe in detail the following:**
 - **Advantages and disadvantages of OJT**
 - **Development of OJT**
 - **Conduct of OJT**
 - **Evaluation of OJT performance**
 - **Use of open-ended questioning**
 - **Documenting OJT performance**

Advantages and Disadvantages of OJT

The advantages of OJT are listed below:

- Training takes place in the actual work environment. The trainee is surrounded with the sights, sounds, smells, etc., of the job, so little is left to the trainee's imagination.

- The instructor demonstrates the task at the job site using the same tools and/or equipment the trainee will use to perform the task.
- The instructor can tailor the training to meet the needs of each trainee because the instructor has the option to change the pace, order, depth, and length of instruction to allow the trainee to learn the task.
- The trainee is able to practice the task and gain hands-on experience.

There are also disadvantages to OJT that should be considered:

- The actual job site may not be the best place for training. The equipment at the job site may not be available for the length of time required to conduct OJT. Training may have to take a “back seat” to the requirements for operation. That is, the equipment may simply not be available for training due to operational goals or commitments.
- The cost of OJT can be high. OJT is usually conducted one-on-one, and this method of training and performance testing takes a great deal of time. In some cases, an instructor can train more than one trainee; however, performance tests should always be done one-on-one.
- Certain equipment may be dangerous in the hands of a trainee even under close supervision. (A simulator training setting would be a more desirable setting for tasks that fall in this category.) There is also a chance that a trainee may damage equipment in the process of learning how to operate it.

Development of OJT

This section of DOE-HDBK-1206-98 briefly addresses each phase of the SAT process. Where appropriate, specific guidance for OJT and OJT programs is presented.

The table-top processes for analysis, design, and development described in the DOE handbook, *Alternative Systematic Approaches to Training*, should be reviewed for applicability when developing or modifying OJT programs. These processes can normally produce equivalent results more efficiently than the more traditional methods that have been used. The DOE Training Program Handbook: *A Systematic Approach to Training* contains detailed information regarding all phases of a systematic approach to training and should be referenced for specific details.

Analysis phase. Training requirements can be identified by performing needs analysis, job analysis, and/or task analysis. Analyses form the basis for determining training needs, developing and maintaining valid task lists, and selecting tasks that must be trained on. To facilitate tracking and revisions of training materials on the basis of facility or procedural changes, task lists are entered into systems such as task-to-training matrices. Correctly done, these analyses provide assurance that training is appropriate for the expected performance and identify requirements that serve as the basis for the design and development of OJT programs.

Design phase. Design phase activities include writing terminal objectives, selecting appropriate training settings, and developing of TESs for each task selected for training. It is during the development of the TESs that the bulk of the tasks are further analyzed, enabling objectives are written, and decisions are made regarding how training will be conducted and evaluated. OJT may be conducted using general instructions and task specific evaluation materials for low-hazard potential facilities or tasks.

Development phase. Development phase activities include the writing of training materials such as OJT checklists, qualification standards, and OJT guides. Additional activities include the selection and training of OJT instructors. The specifications generated in the design phase are used to develop an OJT program and all required training materials. Care should be taken to keep OJT materials simple and usable.

OJT checklists (qualification cards) that are specific to an individual OJT program should be developed to document training and performance testing. OJT checklists should be based on knowledge and skills required by the training and evaluation standards. The required level(s) of accomplishing performance testing should be specified for each task. While many options exist for the format of an OJT checklist, only two general formats will be discussed. The first, and probably the most common, is simply a list of all the tasks required for qualification and the required level of performance test accomplishment. In this case, the OJT checklist is used as a signature record card to document the performance testing for each task. The completion of training for each task should also be documented on the OJT checklist. An OJT checklist should reference the OJT guides used to conduct the training and the evaluation standards used to conduct the performance tests. If the trainee must be trained and performance tested on a number of tasks to become qualified, this format is usually the best. Figure 5 illustrates the relationship of the elements that make up the most common type of OJT checklist.

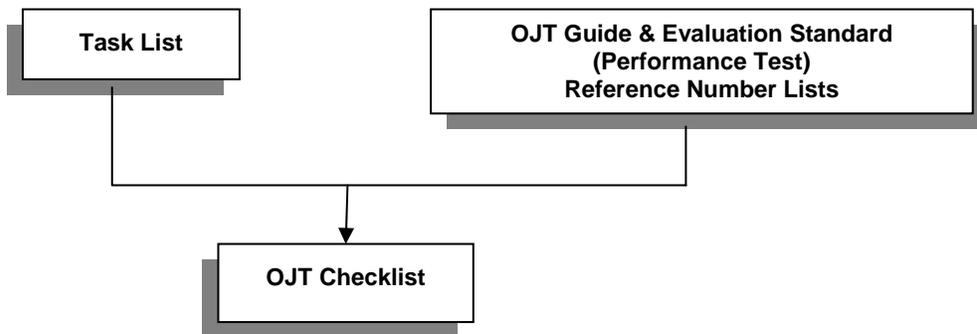


Figure 5. Task list-based OJT checklist

A second format used by some facilities includes each task’s evaluation standard as a part of the OJT checklist (it may also contain each task’s OJT guide). This format, depicted in figure 6, may result in a much larger OJT checklist. If a facility qualifies trainees on a duty area or a task basis, this approach may be workable.

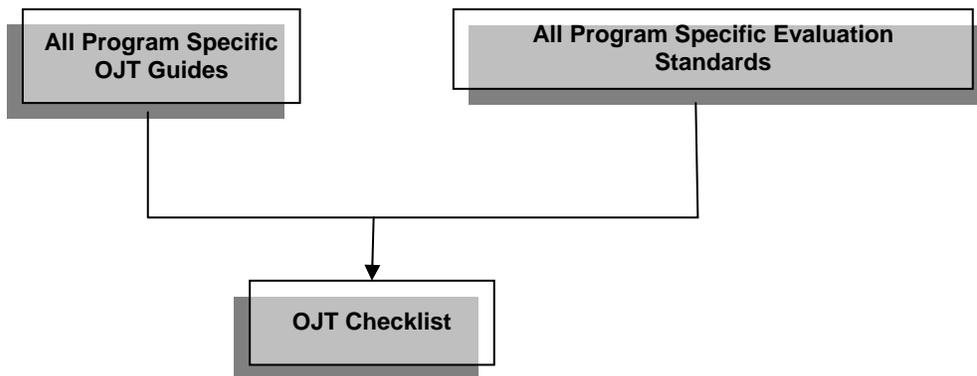


Figure 6. Combination task list/TES OJT checklist

The use of an OJT checklist that has two instructor signatures for each task helps to ensure that OJT is conducted and evaluated as a two-part process. The trainee is taught the task using an OJT guide and is then performance-tested using the evaluation standard.

OJT checklists may contain tasks that have both simulate and perform specified as the acceptable levels of accomplishment. When conducting the OJT and/or the performance test, the OJT instructor should select the highest level of accomplishment that is supported by facility conditions. The OJT guide and the evaluation standard for a task that has multiple levels of accomplishment should be written to support the training and the evaluation at either level of accomplishment.

For tasks with a single level of accomplishment, there may be times that facility conditions do not support performance testing at the specified level of accomplishment. If this is the case, the instructor should inform the OJT program coordinator. The program coordinator may then reschedule the performance test or, with management's documented concurrence, the specific level of performance test accomplishment may be lowered. This documented concurrence should be attached to, and become a permanent part of, the trainee's OJT checklist.

Qualification standards. Qualification standards are documents that contain the knowledge and skill requirements necessary for the successful completion of a training program. A qualification standard should provide explicit guidance to the instructor and to the trainee to aid in the preparation for and the consistent administration of performance tests. A qualification standard should include all program-specific evaluation standards to be used during performance testing. Facilities that qualify employees on a task basis need not develop a qualification standard. In this case, the OJT instructor and the trainee only need the task's evaluation standard.

A qualification standard should be prepared consistent with the program's OJT guides and evaluation standards. It should list the specific procedures and training resource materials required for each task (e.g., operating procedures, system descriptions, fundamentals text).

This type of information may also be specified on the qualification card/checklist or in other training documents or procedures. The qualification standard may also include reading assignments, self-study requirements, study questions, problem analysis exercises, figures and diagrams, and amplifying information. Qualification standards should not include copies of facility procedures or training manuals/materials. They should instead reference these resources.

Trainees in an OJT program that requires self-study should find the qualification standard a very useful document. It provides them with information on what to study, where this information may be found, and guidance on what they need to learn.

A qualification standard should contain a section that provides a trainee entering an OJT program with information on how that specific program operates, what will be expected of him/her, and how/where to obtain training-related help. It should provide information regarding the use of the OJT checklist and how to use the qualification standard. This

section of the qualification standard should also address the following (if not included in other training documents or procedures):

- Facility restrictions on unsupervised trainee operation of facility equipment/systems
- Guidelines on self-study
- Guidelines on improving listening habits
- Established goals and how trainee progress will be tracked
- How the trainee interacts with the OJT instructor/program coordinator
- How to prepare for performance tests
- Comprehensive testing/evaluation required at the program's completion

OJT guides. Performance-based training programs should require the use of OJT guides (or equivalents) to ensure consistent delivery of training. An OJT guide is a document that outlines instructor and trainee activities, learning objectives, training content, and the resources (equipment, material, etc.) necessary for the consistent conduct of training. The contents of an OJT guide for a specific task should be based on the training standard portion of the TES. An OJT guide should identify trainee prerequisites, learning activities, training equipment, and materials needed for training and specific guidance for their use. OJT guides also provide specific direction to the instructor for guiding the learning process.

Some may question the necessity of OJT guides for on-the-job training. However, one of the most frequently asked questions is, "How can we ensure consistent training from one instructor to the next?" One way to ensure this is by the use of the OJT guide. It may be a part of the OJT qualification card/checklist or a stand-alone document. In either case, it should reference the specific task it supports and should be organized and formatted to enhance the one-on-one learning process.

Instructor selection and training. The credibility of a training program (and OJT programs in particular) depends on the quality of the instructors. OJT instructors should be qualified to deliver on-the-job training and/or conduct performance tests. The selection of OJT instructors is the responsibility of each facility's line and training management; however, first-line supervisor and senior job incumbents are the recommended first choices for OJT instructors. OJT instructors should be trained and qualified in accordance with the guidance in the DOE Guide to Good Practices for Training and Qualification of Instructors.

Several factors should be considered when selecting OJT instructors. OJT instructors should be technically competent. They should have the skills necessary to train and evaluate assigned trainees. Additional factors to be considered when selecting OJT instructors include recognition of responsibilities, professionalism, maturity, judgment, integrity, safety awareness, communication skills, personal standards of performance, and a commitment to quality.

The options normally available for selecting OJT instructors are the first-line supervisors and senior job incumbents or an instructor from the training organization. The supervisors and senior job incumbents are usually SMEs who supervise or perform the job. As such, they have first-hand knowledge of the job. An instructor from training may well be an expert on training, but will typically not be as knowledgeable or proficient in the specifics of the job as an SME. It is usually better to train the supervisor or senior incumbent to be an effective instructor than to train the instructor to be a job expert. When OJT is conducted and evaluated using facility equipment, the instructor must be qualified to perform the task.

OJT instructors should receive instructor training in advance to allow sufficient time to develop instructor competency prior to working with trainees. When instructors have not yet attained the required instructional qualifications or only instruct occasionally, training quality may be maintained through mock training exercises and appropriate supervision and assistance.

All OJT instructors should be given the opportunity to enhance their technical competency and instructional skills. Continuing training that is based on periodic instructor performance evaluations should be provided to all qualified instructors. Instructor evaluations should include direct observation by training and operations supervision during training sessions, and should address technical competency, instructor skills, and overall effectiveness in facilitating the trainee's achievement of the learning objectives. Both announced and unannounced evaluations are appropriate.

Conduct of OJT

During this phase of OJT, the instructor introduces and explains the task to be performed and demonstrates to the trainee how to perform the task. The instructor then supervises the trainee's practice of the task. For high-hazard potential tasks, this phase of the OJT process is separate and distinct from the evaluation phase of OJT. For low-hazard tasks, OJT may be conducted and evaluated simultaneously. This may also be appropriate for category 3 hazard nuclear facilities.

Instructors should use the "Three Ts" of effective training as they conduct OJT. The first "T" is "tell them what you are going to tell them," the second is "tell them," and the third is to "tell them what you told them." Use of the three Ts helps to ensure effective on-the-job training.

The primary instructional method used in the on-the-job training setting is the demonstration-performance method. In this method, the instructor tells and shows the trainee how to perform the task. The shop foreman teaches the apprentice almost entirely by some version of this method, and the flight instructor uses it to teach flying skills. The instructor explains and demonstrates the particular task to the trainee and then coaches while the trainee practices the task. This method is based on the principle that trainees learn best by doing. During the practice, the instructor points out errors and helps the trainee improve techniques or eliminate errors in performance. The trainee is allowed repeated practice to achieve the terminal objective. When the trainee has satisfied the objectives, the instructor concludes the training and documents it on the trainee's OJT checklist.

Evaluation of OJT Performance

During the evaluation phase of OJT, the instructor (evaluator) administers a performance test to assess the trainee's performance against predetermined performance standards. The evaluation phase should be separate and distinct from the training phase. However, OJT for low-hazard tasks may be conducted and evaluated simultaneously. This may also be the case for category 3 hazard nuclear facilities. During the evaluation phase, the instructor tests the trainee. The time for instruction has ended.

Performance testing. A performance test (sometimes called a practical factor) is a hands-on demonstration by the trainee of the knowledge and skills required to perform a task.

Performance tests should be given and evaluated by qualified OJT instructors. The instructor uses an evaluation standard from a TES (or equivalent) to determine if the trainee has the knowledge and skills to perform the task. A trainee's knowledge may be assessed prior to, during, or following task completion.

It is suggested that safety-related questions should be asked prior to task performance. A limited number of questions may be asked during the performance test if they will not distract the trainee from the task's performance, with the remaining questions asked following task completion.

The trainee is tested following the completion of training and any additional practice necessary to develop proficiency. Just as in the training phase of OJT, the evaluation phase consists of several distinct steps. To conduct a performance test, the trainee and the instructor should prepare for the test. The instructor should then brief the trainee, conduct the performance test, debrief the trainee, and document the performance test.

Use of Open-Ended Questioning

Usually it is not enough for employees to only possess the skills to operate a tool, a component, or a system. Knowledge of the underlying theory/principles of operation, interactions with other systems, and actions to perform if the equipment or system doesn't operate properly should also be required. To assess a trainee's knowledge, the instructor must ask questions to verify understanding of the task; however, the instructor should not ask questions to distract the trainee. All questions asked during a performance test should be related to the task's terminal and enabling learning objectives, starting with the easier questions. This technique tends to build confidence and puts the trainee at ease. The instructor may then progress to more thought-provoking questions. The instructor may also ask the trainee to talk through the task as he/she performs it. This technique reduces the number of questions the instructor needs to ask and allows the instructor to stop the trainee before he/she makes a serious mistake. The questions used may be written in the evaluation standard (preferred method) or generated by the instructor during the performance test. Approved questions may be maintained in a question and answer bank and inserted into the evaluation standard prior to conducting a performance test.

Benefits of developing written questions for the instructor to ask as a part of the performance test include standardizing the knowledge assessment portion of the test and minimizing the diversion of the instructor's attention from the trainee's answer (the instructor may be thinking about what to ask next while the trainee is answering the current question). Wrong responses may then go unnoticed, thus reinforcing in the trainee's mind that what he/she said was correct when, in fact, it was not. The questions asked during the performance test should test understanding and judgment as well as factual knowledge.

If the evaluation standard was developed with questions and answers built into it, the instructor should select appropriate questions to spot-check the trainee's knowledge. Questions asked during the test need not be restricted to those stated verbatim in the evaluation standard. The instructor may rephrase or expand them as appropriate. The instructor should also keep in mind that the trainee's answer will usually not be a verbatim answer. The instructor should record on the evaluation standard whether the trainee's response was satisfactory or unsatisfactory, and if unsatisfactory, the given response.

If questions are not included as a part of the evaluation standard, the instructor should ask questions to assess knowledge and record them as previously described.

The instructor has the option of asking several different types of questions during the performance test. This applies equally well to developing questions as part of an evaluation standard or to the instructor who is administering a performance test that was developed without questions. The two most common question types are the open-ended question and the closed-ended question. A good mix of these two types of questions should provide the instructor with enough information to determine whether the trainee has adequate knowledge.

The open-ended question places the burden of conversation on the trainee and gives the instructor time to analyze what the trainee is saying. It reduces the total number of questions asked and is very useful when starting a line of questioning in a new subject area.

Documenting OJT Performance

If the trainee has satisfactorily performed the task, the OJT checklist should be signed and dated by the instructor. If the task has multiple levels of accomplishment, the instructor should indicate on the OJT checklist the level at which it was accomplished.

b) State and describe the roles and responsibilities of the training organization and line management to ensure effective implementation of an OJT program.

The ultimate success of any training program requires a strong commitment to training by both line organization management and training management. The concurrence of these organizations regarding goals and content of an OJT program is essential for effective training. (Training review/steering groups have been an important link in this process at several facilities.) However, the facility's line organization has the ultimate responsibility for the proper training of their personnel.

c) Discuss the differences between formal and informal OJT.

Studies show that employees who are trained with formal OJT require only 20 percent as long to achieve mastery as those in informal OJT. The 80 percent difference is time employees can spend being productive.

Studies also show that formal OJT is only half as expensive as informal OJT in terms of supervisor's time and reduced output and quality.

Informal OJT is unplanned, unevaluated, undocumented, and unsupportive of quality and ISO programs.

Formal OJT is planned, prioritized, and scheduled. Trainers are trained; trainees learn quickly and correctly, and are evaluated; and the results are documented, so quality and ISO programs are supported.

Formal OJT can support your classroom training and internet training by providing follow-up on-the-job practice to ensure real competence.

Finally, formal OJT is faster, better, and cheaper than informal OJT.

d) Describe the role of the trainer, the evaluator, and the trainee in the OJT process.

Trainer

The primary role of the trainer is to ensure the quality of the process. The trainer develops the OJT experience, implements the training, and evaluates the trainee's results.

Evaluator

The evaluator is responsible for ensuring that the training experience meets the stated objectives and that the trainee has acquired the targeted skills and abilities. The evaluator is also responsible for recommending improvements to the process.

Trainee

The trainee is responsible for performing the required task according to the guidelines and specifications provided by the trainer.

e) List and discuss the process steps that OJT instructors use to help trainees learn on the job.

The process steps that OJT instructors use to help trainees learn on the job are

- preparation
- introduction
- explanation
- demonstration
- practice
- conclusion

The following paragraphs provide a brief description of each of these steps.

Preparation

Instructors should adequately prepare prior to conducting OJT to ensure consistent and effective training. A major portion of preparation should be a review of the OJT guide (or equivalent). This review should concentrate on the equipment and/or tools required, expected trainee preparations, reference materials, and safety precautions, and may include a review of the factors that influence trainee learning and motivation. The instructor should review the procedures referenced by the OJT guide, prepare the job site, and ensure that all necessary tools, materials, and procedures are available. The instructor should also ensure that sufficient time for the training has been scheduled.

Introduction

The instructor should put the trainee at ease. It is natural for a trainee to be somewhat nervous at first, especially if this is the first contact with the instructor. Time spent putting the trainee at ease will normally be time well spent. A relaxed trainee will be more receptive to the OJT process. The instructor should motivate or arouse the trainee's interest in the training session. An adult likes to see a direct link between his/her job and the skills and knowledge presented during the training. To help to establish this link, the trainee needs answers to the following questions:

- What's in it for me?

- Why do I need to learn this?
- When will I use this information?
- How will I use this information?

The trainee should understand the terminal and enabling learning objectives. The instructor should state and discuss the objectives with the trainee to ensure that the trainee understands the required performance, how well it should be performed, and under what conditions.

The instructor should provide the trainee with the first “T” of effective training — “tell them what you are going to tell them.” The instructor should present an overview of the task that includes not only what will be learned, but how it will be presented. The overview should be brief and stress safety measures and compliance to procedures. This process may also help to relate this training to previous or future training. The instructor should make sure the trainee understands that he/she can ask questions anytime during the training.

The instructor should continue to stress safety while establishing the ground rules regarding how he/she intends to conduct the training. Explain under what circumstances the evolution will be interrupted (e.g., to demonstrate if needed) and under what circumstances the evolution will be stopped (e.g., if personnel or equipment safety concerns arise). The instructor should stress that facility procedures (administrative, operations, maintenance, lockout and tagout, radiological, etc.) must be adhered to at all times.

The instructor should determine what the trainee already knows about the particular job or task. The instructor should then tailor the training based on a combination of the trainee’s experience, knowledge, and training completed to date. By briefly reviewing what the trainee knows and then progressing to new material, the risk of losing the trainee’s attention will be minimized.

The instructor should minimize interruptions during the training process. The presence of co-workers at the training site may be a problem because the trainee needs to be able to practice, make errors, and receive corrective instruction without personal embarrassment.

Although elimination of all co-workers from the vicinity of the training is difficult or impossible, some degree of privacy is needed.

The last step in the introduction is to express confidence that the trainee will learn to perform the task quickly and well. The goal is for the trainee to begin the training with a feeling of confidence and a desire to meet the challenge.

Explanation

For a simple task, the instructor may combine the explanation and demonstration steps of OJT. For a complicated or hazardous task, however, it is usually better if the instructor separates these two steps.

The instructor tells the trainee how to perform the task — the second “T” of effective training. The instructor should clearly describe the action(s) the trainee is expected to perform. An important consideration in this step is the language used. Instructors should speak on a level the trainee understands and fully explain technical terms.

The instructor should stress key points and critical steps during the explanation of the task. This helps the trainee differentiate between the important (critical) and the not-so-important information. Full use should be made of being at the job site to explain the task and bring to the trainee's attention any cues and/or stimuli related to the task. The instructor should explain why and in what order procedural steps or task elements are done to reinforce learning and stress safety by his/her words and actions.

An effective explanation requires two-way communication between the instructor and the trainee. The instructor should ask the trainee questions to verify comprehension and should be patient and willing to explain something as many times as necessary. The instructor should answer any questions the trainee asks.

Most skills lend themselves to a sequential pattern where the instructor explains the skill in the same order in which it is performed. When the instructor can relate material to what a trainee already knows, the known-to-unknown strategy may be used effectively. When teaching more than one skill, the simple-to-complex strategy works well. By starting with the simplest skill, trainees build confidence and are less likely to become frustrated when faced with more complex skills. The instructor should not describe short cuts or unapproved alternative methods of performing a task. The instructor should not try to impress the trainee with his/her knowledge, because training should be trainee centered.

Demonstration

During the demonstration step, the instructor shows and explains to the trainee how to perform the task. The instructor may demonstrate the complete task and then require the trainee to practice, or they may perform the demonstration and practice steps together on an element-by-element basis. A well-written OJT guide (or equivalent) should provide the necessary guidance to the instructor regarding the most effective techniques to use.

It is important that the instructor demonstrate the skill correctly and safely the first time. If demonstrated incorrectly, the instructor's credibility is reduced and the trainee will have to unlearn the incorrectly presented material before he/she can learn it correctly. The instructor should stress safety and compliance with facility procedures. An effective way to do this is by his/her own personal actions. Since the trainee generally imitates the instructor's performance, the instructor should demonstrate the task exactly the way it should be performed. The instructor should ask the trainee frequent questions and explain or demonstrate task elements again as necessary. The instructor should proceed slowly and continue the demonstration only after it is clear that the trainee understands.

Practice

The instructor should closely supervise the trainee's initial practice to ensure safe and correct task performance. An effective method of conducting the practice step is to have the trainee talk through the key points and demonstrate the main steps of the task. During the practice session, the instructor should ask the trainee questions regarding what is being done, why it is done, and what indications to look for. The trainee should practice at his/her own pace without unnecessary interruption or too much instructor assistance. As the trainee gains proficiency, the instructor should reduce or fade his/her coaching. However, the instructor should never hesitate to stop the trainee if a mistake can be prevented or has been made. The

instructor should correct improper actions promptly and without belittling the individual. The trainee will usually know what he/she did wrong, and very little correction should be necessary. The instructor should be patient and provide positive comments on the trainee's initial efforts.

Sufficient time should be scheduled to allow for trainee practice. Depending on the difficulty a trainee is having performing a task, the instructor may have to schedule additional training and practice at a later date. The time to identify and correct errors is during the training rather than during the performance test.

The OJT guide (or equivalent) should specify the degree of supervision that is required when the trainee practices under supervision. Facility procedures and the hazard or complexity of the task should be the overriding factor in this requirement. In both of the following cases the instructor supervises the trainee, but the degree of supervision is different:

- **Controlled.** The instructor closely supervises the trainee. The trainee works at his/her own pace, but the instructor is always ready to stop him/her to prevent or correct mistakes.
- **Independent.** The instructor allows the trainee to practice the task at his/her own pace following the demonstration. This method has limited usefulness for facility operators, but may work quite well in a shop or laboratory environment. The instructor closely supervises the trainee the first time he/she practices the task and then allows the trainee to practice independently, periodically checking and coaching as necessary.

Regardless of the method used, the end result should be sufficient trainee practice to develop proficiency in task performance (i.e., performance satisfies the learning objectives).

Conclusion

The conclusion of the training phase of OJT usually consists of three important elements. The first element is a summary of the training and is the last "T" of effective training — "tell them what you told them." The summary consists of a review of the learning objectives and the task steps. The instructor should make positive comments and praise what the trainee did well.

This should be done even during review of an area in which the trainee had difficulty. However, it is equally important to discuss the areas in which the trainee had difficulty, because suggestions for ways to improve specific difficulties are also important.

The second element is to provide additional motivation for the trainee. Reinforce how this training will help him/her perform on the job, and discuss how it relates to previous and future training.

The last element is to document the training. Facility training procedures should specify how the instructor documents completion of training. One method is to document the training on the individual's OJT checklist.

- f) Describe the format and content of a typical OJT training guide and job performance measure or evaluation standard, including a discussion of the essential elements of each.**

Performance-based training programs should require the use of OJT guides (or equivalents) to ensure consistent delivery of training. An OJT guide is a document that outlines instructor and trainee activities, learning objectives, training content, and the resources (equipment, material, etc.) necessary for the consistent conduct of training. The contents of an OJT guide for a specific task should be based on the training standard portion of the TES. An OJT guide should identify trainee prerequisites, learning activities, training equipment, and materials needed for training and specific guidance for their use. OJT guides also provide specific direction to the instructor for guiding the learning process. The relationship of an OJT guide to the TES and the OJT guide's content is depicted in figure 7.

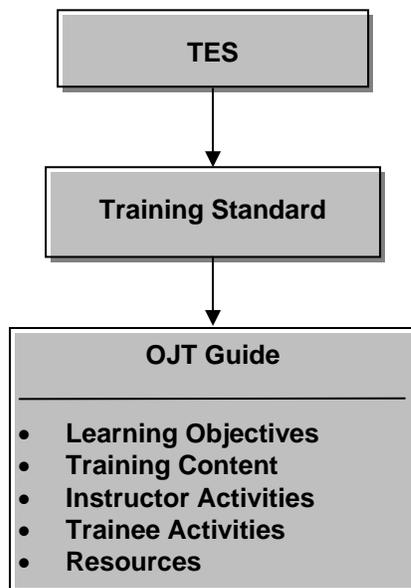


Figure 7. OJT guide

OJT guides should not contain copies of facility procedures. Rather, they should reference the appropriate procedures and provide the instructor with task-specific guidance which enhances the learning process. It should not include generic instructions that would be more appropriate in a training procedure or other type of guidance document. This practice helps ensure that the system/facility is operated only with approved procedures (which adds realism to the training), rather than with training materials, and will minimize revisions to the OJT guide as facility procedures are revised.

OJT guides should be prepared with the assistance of the OJT instructor serving as the SME. They should be reviewed by an additional SME who was not directly involved in their development, and should be approved prior to use by supervisory members of the training staff and the management of the work group for which the training was developed.

There are numerous factors which can have a significant influence on a trainee's learning and motivation during the OJT process. Instructors or training material designers/developers should use these factors as they develop OJT guides.

There are many OJT guide formats that could be successfully used for on-the-job training. OJT guides normally consist of a cover page, a body, and a conclusion. It should be noted

that much of this information may be included in the qualification card/checklist or other appropriate training procedures or guidance documents. The cover page should provide the instructor with the following information:

- Task title, number, and estimated time to complete the training
- Tools, materials, equipment, and references required
- Safety precautions and procedural limitations
- Reference to relevant facility procedures, facility conditions, and whose permission is required
- Terminal and enabling objectives
- Trainee prerequisites
- Notes to the instructor — guidance/suggestions
- OJT guide review and approval signature(s)

The body is the outline for the instructional process and includes the following major sections:

- Introduction
- Explanation
- Demonstration
- Practice under supervision

The conclusion includes the following elements:

- Summary
- Additional motivation
- Documentation of training

g) List and discuss the key elements and components of a valid and reliable practical evaluation process for evaluating trainee knowledge and skill upon completion of OJT.

During the evaluation phase of OJT, the instructor (evaluator) administers a performance test to assess the trainee's performance against predetermined performance standards. The evaluation phase should be separate and distinct from the training phase. However, OJT for low-hazard tasks may be conducted and evaluated simultaneously. This may also be the case for category 3 hazard nuclear facilities. During the evaluation phase, the instructor tests the trainee.

Performance Testing

A performance test (sometimes called a practical factor) is a hands-on demonstration by the trainee of the knowledge and skills required to perform a task. Performance tests should be given and evaluated by qualified OJT instructors. The instructor uses an evaluation standard from a TES (or equivalent) to determine if the trainee has the knowledge and skills to perform the task. A trainee's knowledge may be assessed prior to, during, or following task completion.

It is suggested that safety-related questions should be asked prior to task performance. A limited number of questions may be asked during the performance test if they will not distract the trainee from the task's performance, with the remaining questions asked following task completion.

The trainee is tested following the completion of training and any additional practice necessary to develop proficiency. Just as in the training phase of OJT, the evaluation phase consists of several distinct steps. To conduct a performance test, the trainee and the instructor should prepare for the test. The instructor should then brief the trainee, conduct the performance test, debrief the trainee, and document the performance test.

Preparing for a Performance Test

Trainee preparation. The trainee should review the evaluation standard and the OJT checklist to determine the required level of accomplishment. If there has been a significant time lag between the completion of training and the scheduled performance test, the trainee should study and/or practice the task under an OJT instructor's supervision to help refresh his/her skills. The trainee should confirm the scheduled evaluation time, review safety requirements, and obtain any necessary safety equipment.

Instructor preparation. The instructor should confirm scheduled evaluation time with the trainee and verify completion of all prerequisite training. The instructor should prepare for the performance test by reviewing the materials that will be used (the OJT checklist, the evaluation standard for the task, and the procedure). If time permits, the instructor may want to walk through the task to ensure he/she is current on task specifics.

The instructor should ensure that required facilities, equipment, personnel, materials, etc., will be available at the scheduled time, and that facility operations will support and allow the level of accomplishment specified for the performance test.

Briefing the Trainee

Prior to conducting a performance test, the instructor should provide the trainee with an overview of the performance testing process and explicit instructions regarding the task to be tested. That is, the instructor should provide clear and complete instructions as to what the trainee is/is not allowed to do and explain under what circumstances he/she will stop the trainee (such as in case of danger to personnel or equipment).

The instructor should review the evaluation standard with the trainee and explain the standards of acceptable performance. The instructor should tell the trainee that any answer or action that would place personnel, the facility, or system in danger is an immediate failure of the performance test regardless of the acceptability of other responses.

Conducting the Performance Test

A performance test is not an instructional process. Its purpose is to evaluate the trainee's skills and knowledge. The instructor should not coach or prompt the trainee by giving hints, by asking leading questions, or by his/her actions. If a task requires the trainee to go to a location, the instructor should not lead the way. If the evaluation standard references a procedure, that procedure should be available to the trainee during the test but should not be handed to the trainee by the instructor. Part of the performance test is to assess the trainee's use of procedures and understanding of their importance.

With most tasks, the instructor should be able to determine if the trainee is performing the task correctly by observing and comparing the trainee's actions to the evaluation standard and the procedure. The instructor should evaluate the trainee's ability to

- obtain the needed reference material and tools without difficulty
- use the references and tools correctly and in the proper sequence
- observe applicable facility safety rules when performing the task
- manipulate the equipment in a deliberate and timely manner
- recognize equipment status (such as, does he/she recognize when a valve is open or a pump is running)

Usually it is not enough for employees to only possess the skills to operate a tool, a component, or a system. Knowledge of the underlying theory/principles of operation, interactions with other systems, and actions to perform if the equipment or system doesn't operate properly should also be required. To assess a trainee's knowledge, the instructor must ask questions to verify understanding of the task; however, the instructor should not ask questions to distract the trainee. All questions asked during a performance test should be related to the task's terminal and enabling learning objectives, starting with the easier questions. This technique tends to build confidence and puts the trainee at ease. The instructor may then progress to more thought-provoking questions. The instructor may also ask the trainee to talk through the task as he/she performs it. This technique reduces the number of questions the instructor needs to ask and allows the instructor to stop the trainee before he/she makes a serious mistake. The questions used may be written in the evaluation standard (preferred method) or generated by the instructor during the performance test. Approved questions may be maintained in a question and answer bank and inserted into the evaluation standard prior to conducting a performance test.

Benefits of developing written questions for the instructor to ask as a part of the performance test include standardizing the knowledge assessment portion of the test and minimizing the diversion of the instructor's attention from the trainee's answer (the instructor may be thinking about what to ask next while the trainee is answering the current question). Wrong responses may then go unnoticed, thus reinforcing in the trainee's mind that what he/she said was correct when, in fact, it was not. The questions asked during the performance test should test understanding and judgment as well as factual knowledge.

If the evaluation standard was developed with questions and answers built into it, the instructor should select appropriate questions to spot-check the trainee's knowledge. Questions asked during the test need not be restricted to those stated verbatim in the evaluation standard. The instructor may rephrase or expand them as appropriate. The instructor should also keep in mind that the trainee's answer will usually not be a verbatim answer. The instructor should record on the evaluation standard whether the trainee's response was satisfactory or unsatisfactory, and if unsatisfactory, the given response.

At the completion of a performance test, the instructor must make a judgment call. Compared to the evaluation standard, did the trainee have satisfactory knowledge and skills or not? The use of a detailed evaluation standard that includes questions and answers will reduce the subjectivity of this decision. There are many possible outcomes of a performance test. The following three are generic examples:

- The trainee demonstrated satisfactory skills and knowledge, with no weak points. The instructor signs the trainee's OJT checklist.
- The trainee demonstrated satisfactory skills and knowledge, but lacked information on some minor details. The instructor may cover those details during the debrief and sign the trainee's OJT checklist.
- The trainee's performance was unsatisfactory. The trainee lacked necessary skills or showed a significant lack of knowledge and understanding. The instructor should counsel the trainee as to the remediation required and what to practice or study, and should request the OJT program coordinator to reschedule additional training and another evaluation. The instructor should also discuss the trainee's performance with the program coordinator.

Debriefing the Trainee

At the completion of a performance test, the instructor should conduct a detailed review of the trainee's performance. The instructor should tell the trainee if he/she passed or failed the test.

The instructor should make positive comments while reviewing the performance test results. Based on the outcome of the test, the instructor should either discuss the knowledge items missed with the trainee or require the trainee to find the correct answers.

Documenting Performance Test Completion

If the trainee has satisfactorily performed the task, the OJT checklist should be signed and dated by the instructor. If the task has multiple levels of accomplishment, the instructor should indicate on the OJT checklist the level at which it was accomplished.

h) Prepare and administer an OJT session and corresponding performance evaluation for an assigned training program or course.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

8. Technical training personnel shall demonstrate a working-level knowledge of oral, written, and performance evaluation techniques and methodologies, and other techniques used to evaluate the effectiveness of a training program.

- a) **Using DOE-HDBK-1078-94, DOE-HDBK-1204-97, Guide to Good Practices for the Development of Test Items, and DOE-HDBK-1205-97, Guide to Good Practices for the Design, Development, and Implementation of Examinations, describe in detail the following:**
 - **Purpose of testing**
 - **Correlation between tests and learning objectives**
 - **Types of test item formats**
 - **Selection of test item formats**
 - **Use of test item statistics to evaluate the quality (validity and reliability) of test items and training material**
 - **Use and control of examination banks**

Purpose of Testing and Correlation Between Tests and Learning Objectives

Test items are developed to be consistent with the learning objectives. The purpose of the test item is to measure trainee performance against the criteria stated in the learning objective.

Types of Test Item Formats

Test items are developed from the learning objectives to measure trainee skills, recall, and/or application of information. Test item formats that are preferred in a performance-based system include the following: performance, completions/short answer, multiple choice, matching, alternate choice, and drawing/labeling. Other test item formats may have applications in specific situations.

Selection of Test Item Formats

Selection of the test item format is guided by the action verbs of the learning objectives. Action verbs of the learning objectives suggest one format to be more appropriate for use in testing than others.

Skill action verbs suggest a performance test format, and knowledge action verbs suggest one or more of the written formats. For example, “start” and “shut down” are skill action verbs that suggest a performance test format.

The completion/short-answer format is appropriate for many knowledge actions verbs, including “recall,” “identify,” and “list.”

Action verbs such as “discriminate” and “select” should be tested using a multiple choice format.

Learning objectives that require the student to “classify” or “relate” should be tested in the matching format.

Use of Test Item Statistics to Evaluate the Quality (Validity and Reliability) of Test Items and Training Material

Program evaluation information must be analyzed before it can be used to make changes in training. The simplest method of analysis that will yield the information required should be used. Analysis methods include exception analysis and content analysis. Some types of data should be organized and tabulated using frequency distributions prior to analysis. Apparent performance discrepancies must also be verified through discussions with appropriate personnel. The following activities are used to analyze data: frequency distributions, exception analysis, content analysis, and root cause identification.

Frequency distributions. Frequency distributions should be used for organizing, summarizing, and displaying data. They can be constructed using simple counting, averaging, and graphing procedures that show how often particular events have occurred. They are normally used as the first step in analyzing responses to surveys and trainee progress test results. After all data from the indicators is collected, responses are tabulated. Totals are then entered into the corresponding spaces on a blank survey. The average (mean) response for each item is calculated and displayed on a bar chart. The bar chart presents survey information in a simple visual form. It highlights high and low values and permits easy comparison with acceptable performance standards or sets of previous data.

Exception analysis. Exception analysis is used for reviewing data to detect unacceptable variations from a predefined standard. Facility operating, maintenance, and industrial safety experience should be analyzed using this method. Increases in the frequency of accidents, injuries, personnel errors, rework or unscheduled maintenance, or increases in overtime above normal levels may indicate a need to provide additional training or improve existing training. Acceptable levels should be established for each of these parameters as criteria for comparison. If any observed value deviates from the criteria, the cause should be investigated. Feedback from employees and employee exams, supervisors, and instructor and trainee critiques should be analyzed to indicate if any training problem needs to be investigated.

Content analysis. Content analysis depends primarily on the expertise and professional judgment of the individuals performing it. Content analysis should be considered for use with all types of information and may be used in conjunction with exception analysis. Interview responses should be analyzed using content analysis. The following guidelines should be used when performing content analysis:

- Look for agreement. If respondents provide the same or similar answers, these answers are more likely to be valid.
- Do not disregard responses. Do not attempt to second-guess employees, supervisors, or subject matter experts. If a response appears erroneous or exaggerated, follow up with observations and additional discussion.
- Focus the analysis on discovering specific tasks or subject areas in which training refinements seem necessary.

Root cause identification. Identification of the root cause should lead to determination of the appropriate corrective action. Use training and facility personnel in the identification of root causes and the determination of appropriate solutions. In general, root causes are identified by first identifying specific symptoms of the problem. Then alternative causes are generated and investigated until they are confirmed or eliminated.

Identification of root causes may be aided by the use of evaluation standards produced during the design phase. When facility events or feedback from employees or their supervisors indicate that workers have difficulty with specific tasks, administering applicable evaluation standards to a group of workers may disclose the nature of the problem and its cause.

Use and Control of Examination Banks

A test item bank should be developed and maintained current. The items in the test bank will be used in the future to construct entry-level tests, pre-instruction tests, progress tests, or after instruction tests. A tracking system should be developed to correlate test items to the corresponding learning objective.

b) List and discuss the key elements and components of a valid and reliable testing program to evaluate trainee knowledge during, or upon completion of classroom training.

Following are basic principles that apply across all test item formats:

- Ensure that the concept is relevant to the ability to perform the job.
- State the test item concisely.
- Choose the higher cognitive level.

- Make sure the test item matches the learning objective.
- Omit unnecessarily difficult or irrelevant test items.
- Limit the test item to only one concept or topic.
- Avoid copying text directly from reference materials.
- Avoid backwards logic test items.
- Place the easier test items at the beginning of each section.
- The test item should discriminate between those who have mastered the objective and those who have not.

Ensure that the concept being measured has a direct relationship to the ability to perform the job. The construction of the test item should clearly reflect the enabling objective. Word the test item so that it would be considered valid and reasonable to other SMEs using the same reference materials.

State the test item as concisely as possible, but provide all necessary information. The test item should be clear, grammatically correct, and free of clues to the correct answer. It should be written at a reading level appropriate for the trainee. Often the individuals who develop a test item assume that certain conditions are inherent in the question when, in fact, they are not. It is important to have others review your test items to ensure that all necessary information is included, and that all excess information is deleted. You should ask yourself: Will the trainees clearly know what they are expected to do? Do they have all the information they need to answer the test item? Does answering the test item depend on certain assumptions that must be stated?

When there is a choice between two cognitive levels, write your test item to reflect the higher level. Learning objectives and test items should be written to reflect the level of cognitive domain that is most appropriate. Examinations should consist of higher-level cognitive test items.

Make sure that the test item matches the learning objective. It is very easy to end up with a test item that tests a relatively trivial aspect of an important learning objective. When reviewing your draft test item, ask yourself whether it is likely that someone could answer the test item correctly and still not meet the objective or perform the tasks.

Omit test items that are irrelevant. When reviewing your draft test item, ask yourself: could someone do the job safely and effectively without being able to answer the test item? If so, is it because the content is inappropriate, the wording is unclear, or the level of understanding is too great?

Limit the test item to one concept or topic, unless a synthesis of concepts is being tested. Each individual test item should be reserved for testing one topic, and that topic, as well as the intent of the test item, should be clear to both examiner and trainee. There is a common misconception that testing for multiple topics in one test item is a time-efficient way to examine. Test items containing a variety of topics only serve to confuse the trainee about the purpose of the test item and, therefore, what is expected in terms of a correct response.

Avoid copying text directly from training or other reference material. Test items written in this way generally encourage rote memorization. Further, copying from reference material can cause confusion in test items because the material lifted often draws its meaning (and

importance) from its surrounding context. Therefore, important assumptions or conditions stated elsewhere in the material are often omitted from the test item.

Avoid backwards logic test items, i.e., those test items that ask what should be provided in the test item, and provide what should be required in the trainee's response. It is important to test topics in a way consistent with how the topic should be remembered and used. For example, consider the following test item:

If it takes 12.5 cubic feet of concrete to build a square loading pad 6 inches thick, what is the length of one side of the pad?

This test item gives the test takers information they should be asked to calculate, while it requires them to provide information that would be supplied in an actual work situation. In constructing your test items, make sure that you include information that trainees would typically have or have access to, and require responses that reflect the decisions, or calculations, or other information they would typically have to supply.

Place the easier test items at the beginning of each section. These test items help trainees gain composure and confidence. However, this is not to say that extremely easy test items should be included in the exam for the sole sake of relieving trainee tension.

Finally, a test item must be worded so that it discriminates between those who have mastered the objective and those who have not. A well-written test item should parallel the objective that it is testing.

c) Prepare and administer a training evaluation for an assigned training program or course.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

d) Using DOE-HDBK-1078-94 and DOE-HDBK-1201-97, Guide to Good Practices: Evaluation Instrument Examples, describe the methods used to monitor the effectiveness of training, including:

- **Operating experience**
- **Supervisor feedback**
- **Trainee feedback**

The key to conducting an effective training evaluation is to first identify the questions to be answered by the evaluation. Should the program be modified? What performance gains are being realized? Is the need for training being addressed in the best way possible? The purposes of an evaluation include the following:

- To determine if a program is accomplishing its objectives
- To identify the strengths and weaknesses of a particular training program
- To identify which trainees benefited the most, or the least, from a training program
- To determine if a program was appropriate for its intended purpose and target population

Training evaluations should be conducted in all available settings (classroom, laboratory, simulator, and on-the-job training) and at various times (during training, immediately after training, three to six months after training, etc.). “What type of training data is needed?” and

“What training setting is being evaluated?” are two questions that will help determine when the evaluation is conducted. The specific setting and time are usually controlled by the level of the training evaluation. There are four levels of evaluation:

- Level I: Reaction — Determines the trainees’ opinion of the training program
- Level II: Learning — Measures the trainees’ achievement of the program goals
- Level III: Application — Determines if trainees are using the new skills on the job
- Level IV: Results — Measures whether training has a significant influence on the organization’s operation

Internal evaluations. Levels I and II focus primarily on internal evaluations. Internal evaluation is the process that collects data by reviewing course materials, trainee test and performance data, the trainees’ reactions to training, instructor evaluations by training staff, and other information coming from the development and use of the actual training program itself.

Information on the trainees’ reactions to training is usually collected on an end-of-course critique form or questionnaire that records the trainees’ impressions about the instructors, course content, materials, facilities, etc. Although this data is subjective, it can be valuable as a quick assessment of training. This data can also be a source of information about the perceived quality of training and materials. Trainees can also be good evaluators of instructor technical competence. The problem with this instrument is that there is very little correlation between how the trainees feel and what they have learned.

Instructors are evaluated by the training staff to determine the adequacy of training delivery. This evaluation should be performed by the training supervisor or a qualified staff member. Instructors should be evaluated regularly in terms of technical knowledge, presentation skills, and interpersonal skills for each training setting they are qualified to instruct. The discrepancies identified in these evaluations should be corrected using a systematic method such as a feedback loop.

Training materials should also be evaluated periodically. This should ensure that the required changes are being incorporated. These changes may include changes to DOE regulations, modifications to equipment or procedures, changes in job scope, and industry operating experiences that impact the training.

External evaluations. Levels III and IV focus on the impact of the training on the job (external). External evaluation is the process that collects data from prior trainees, supervisors, and managers, and from many other outside sources that are beyond the actual domain of the training program.

One method of collecting external evaluation data is to directly observe the graduate during actual job performance. This method is the most direct approach to getting an answer to the question of whether or not the graduate can perform the tasks on the job that he/she was trained for. Observations may be performed by a single evaluator or a team composed of evaluators and subject matter experts. A checklist can be beneficial to aid in observations.

A method of collecting data from prior trainees and their supervisors is to use questionnaires. The use of questionnaires is the least expensive approach for collecting data from graduates and their supervisors. The validity of questionnaires reflects how well the evaluators

prepared and distributed them. A questionnaire should include the tasks that the trainees were trained to perform.

Another method used to collect data from prior trainees and their supervisors is through personal interviews. This method allows evaluators to collect more detailed information than is possible on questionnaires. Evaluators can also follow-up on unclear responses and can clarify any problems the graduate is having. Interviews should concentrate on determining graduate proficiency. This is best accomplished by using a preplanned list of questions.

Instructional quality data is collected during instruction, immediately after instruction, and at various times after training to assure program maintenance. How data is collected is influenced by the type of evaluation instrument used and by the training being evaluated.

This data, or feedback, can be gathered using checklists, numerical rating scales, questionnaires, interviews, or direct observation. Subcontracted training should not be treated differently than facility operating contractor training; therefore, the same evaluation instruments should apply.

9. Technical training personnel shall demonstrate a working-level knowledge of the requirements and attributes associated with an effective records management system.

a) Describe the difference between individual training records and program training records.

The documentation of training includes preparing, distributing, storing, controlling, and retrieving records and reports that address the training program and trainee participation. These records and reports assist management in monitoring the effectiveness of the training program. They also provide a historical reference of changes that have occurred within a program due to evaluations. When documenting a training program, the training program and trainee records are maintained and reports are prepared, as indicated by the recommended steps below.

Maintain Training Program Records

Training program records should be maintained to permit review of content, schedules, and current and past program results. These records should be classified according to type and retention period. They should be located, organized, and indexed for ease of retrieval.

Training program records should include the following:

- Most recent job and task analysis data used in training program development
- Course schedules
- Lesson plans and tests
- Trainee attendance summaries (name, course, dates, and test results)
- Instructor evaluations
- Reports of program audits and evaluations

Maintain Trainee Records

Records of the training and qualification of facility employees should be maintained. Records should be current and organized to permit efficient but controlled retrieval. A trainee's record should contain the individual's training history and the identification of required training that has not been completed. Specifically, trainee records should include the following:

- A summary of the individual's education, training, experience, and qualifications at the time of hire
- A summary sheet indicating the individual's current and previous positions with the company, training received, qualifications achieved, and continuing training required
- A record of training completed, including course titles, attendance dates, test performance, and certifications of successful course completion
- A record of training attended but not successfully completed, including course titles, attendance dates, and test performance evaluations
- A record of waivers or exceptions granted, including course titles and statements of justification

b) Describe the difference between training records and qualification records.

Auditable records of each individual's participation and performance in or exception(s) granted from the training program(s) (instructional and technical as appropriate) should be maintained. Individual training records should include the following (as appropriate):

- Verified education, experience, employment history, and most recent health evaluation summary
- Training programs completed and qualification(s) achieved
- Latest completed checklists, graded written examinations (with answers corrected as necessary or examination keys), and operational evaluations used for qualification (this requires controlled access to training records to maintain examination security)
- Lists of questions asked and the examiner's overall evaluation of responses on oral examinations
- Correspondence relating to exceptions granted to training requirements, including justification and approval
- Records of qualification for one-time-only special tests or operations
- Attendance records for required training courses or sessions

A historical record that documents the initial qualification for each position qualified should be maintained as part of individual training records. For example, if an instructor is initially qualified in 1986, the record should contain the date and name of the qualification. If more than one qualification is achieved and maintained, the individual training record should contain documentation to that effect.

Completed examinations, checklists, operational evaluations, etc., for presently held technical qualification(s) should be maintained in the record. (Some facilities may prefer to maintain a separate file of completed examinations with answer keys for each individual.) When an individual holds qualification in multiple positions, records that support current qualifications for each position should be maintained. Duty area or task qualification should be documented using a similar method (for facilities that use duty area or task qualification

instead of position qualification). Functional supervisors should have access to qualification records, as necessary, to support the assignment of work to qualified personnel.

Upon requalification, records that support the previous technical qualification may be removed from the record and replaced with the information documenting present qualification.

In addition, records of the training programs (including an audit trail documenting the development and modifications to each program) and evaluations of the effectiveness of those programs should also be maintained.

c) List and discuss the items that would typically be found in an individual training and qualification record.

See element “b” of this competency for a discussion of individual training and qualification records.

d) List and discuss the items that would typically be found in a training program record.

See element “b” of this competency for a discussion of training program records.

e) Explain the legal aspects associated with accessing individual training and qualification records.

Items that are exempt from the Freedom of Information Act include things such as test questions, scoring keys, and other examination data used in administering a licensing examination, an examination for employment, or an academic examination before the examination is given or if it is to be given again; scores of tests if the person is identified by name and has not consented to the release of his/her scores; and personnel and medical files and similar files, the disclosure of which would constitute an unwarranted invasion of personal privacy. As such, they are not available to the public. Access to individual training and qualification records should be restricted to the functional supervisor and training department personnel.

f) Describe the difference between an archival records system and a dynamic record retrieval system.

An archival records system is a repository for the non-current records of an organization or institution which are kept because the records have value to that institution. The values can be historical and/or administrative, fiscal, or legal.

A dynamic record retrieval system is a record management system in which records are changed, added to, or edited as conditions change.

g) Audit the training and qualification records for an assigned area or office, and report the results of the audit, including recommendations for improvement.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

h) Discuss the training and qualification documentation expected to be found in the training and qualification records for instructors, including OJT instructors.

Auditable records of each individual's participation and performance in, or exception(s) granted from, the training program(s) (instructional and technical as appropriate) should be maintained. Individual training records should include the following (as appropriate):

- Verified education, experience, employment history, and most recent health evaluation summary
- Training programs completed and qualification(s) achieved
- Latest completed checklists, graded written examinations (with answers corrected as necessary or examination keys) and operational evaluations used for qualification (this requires controlled access to training records to maintain examination security)
- Lists of questions asked and the examiner's overall evaluation of responses on oral examinations
- Correspondence relating to exceptions granted to training requirements (including justification and approval)
- Records of qualification for one-time-only special tests or operations
- Attendance records for required training courses or sessions

A historical record that documents initial qualification on each position qualified should be maintained as part of individual training records. For example, if an instructor is initially qualified in 1986, the record should contain the date and name of the qualification. If more than one qualification is achieved and maintained, the individual training record should contain documentation to that effect.

Completed examinations, checklists, operational evaluations, etc., for presently held technical qualification(s) should be maintained in the record. (Some facilities may prefer to maintain a separate file of completed examinations with answer keys for each individual.) When an individual holds qualification in multiple positions, records that support current qualifications for each position should be maintained. Duty area or task qualification should be documented using a similar method (for facilities that use duty area or task qualification instead of position qualification). Functional supervisors should have access to qualification records, as necessary, to support the assignment of work to qualified personnel.

Upon re-qualification, records that support the previous technical qualification may be removed from the record and replaced with the information documenting present qualification. Superseded information should be handled in accordance with procedures contained in DOE 1324.5B, Records Management Program.

In addition, records of the training programs, including an audit trail documenting the development and modifications to each program and evaluations of the effectiveness of those programs should also be maintained.

i) Audit the training and qualification records for a training organization and report the results of the audit, including recommendations for improvement.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

j) Using DOE-HDBK-1118-99, Guide to Good Practice for Continuing Training, describe the elements of an adequate continuing training program for operators, supervisors, technical personnel, and maintenance personnel, and the records for each.

The long-term goal of a continuing training program should be to maintain and improve employee job performance. A short-term goal of continuing training should be to identify and correct weaknesses in their performance. To help in accomplishing these goals, the objectives and priorities of continuing training should be determined by using needs analyses, job analyses, feedback from facility managers, supervisors, and trainees, periodic evaluation of performance during facility operation, operating experience, compliance training, and the results of examinations. Whenever continuing training is conducted using material originally developed for initial training purposes, the specific objectives to be covered should be clearly defined.

To maintain and enhance the proficiency of facility personnel, a program with both a fixed and a flexible component is suggested. The fixed component is designed to maintain proficiency by providing a structured review of topics selected from the initial training program over a two-year period. The flexible component is used to correct actual or potential weaknesses of personnel and to train on operating experiences, modifications, and procedure changes.

Each facility should have a process for assessing the strengths and weaknesses of their personnel. This process should include analysis of job and training performance evaluations, examination results, interviews designed to assess knowledge, or any combination of these methods. This information should be used to help in determining topics for continuing training and the minimum acceptable standards of performance for individuals. Additional attention and priority should be given to areas of individual and team weaknesses.

Fixed Continuing Training

The fixed component of a continuing training program should satisfy needs and job analysis results, regulatory compliance training, general employee training, and fundamentals training.

Analysis data. Facility-specific analysis data should provide the basis for the continuing training program content to be covered, as well as an initial indication of the desired frequency at which they should be covered. Various forms of analyses may be used depending on the job position and the hazard level of the facility to determine continuing training program content. For example, a needs and job analysis may be required for operators and maintenance personnel whereas a broad-based needs assessment may be appropriate for technical staff and management personnel at the same high-hazard facility. The DOE Handbook for Alternative Systematic Approaches to Training provides additional guidance on which type of analysis would be used under different circumstances.

If a job analysis has been performed, the task difficulty, importance, and frequency (DIF) of performance should be weighed to determine both frequency and depth of presentation. This may be accomplished using the classic DIF decision tree referenced in the Guidelines for Job and Task Analysis for DOE Nuclear Facilities, or the alternative approach suggested in the DOE Handbook for Table-Top Job Analysis. In either case, tasks will be selected as train, no train, pre-train, or overtrain.

The selection of train, no train, pre-train, and overtrain tasks should always be validated by subject-matter experts and management. All tasks that may be performed by facility personnel should be considered. Those tasks identified as overtrain tasks during the job analysis process are by definition tasks that require both initial and continuing training to maintain proficiency. The content for continuing training programs should be identified during the design phase of the SAT process and based on the learning objectives derived from the task statements. The learning objectives derived from the overtrain task statements represent the knowledge and skills necessary to perform these tasks and should be the basis for a major part of the fixed portion of the continuing training program. Pre-train tasks are those tasks that are performed very infrequently and for which there is adequate time to provide training just prior to performance (“just in time training”). Training for pre-train tasks should also be included in the continuing training program to ensure that the training is actually conducted prior to performing the task. For more information on the design process, refer to the following DOE handbooks: Table-Top Training Program Design; Alternative Systematic Approaches to Training; and Training Program Handbook: A Systematic Approach to Training.

If the number of tasks selected as overtrain is found to be unmanageable, the tasks may need to be re-evaluated by training, subject matter experts, and operations and training management to ensure they were classified correctly. A table-top process as described in the DOE Handbook for Table-Top Job Analysis should be used to conduct this re-evaluation. It may not be possible to cover all the learning objectives for all the overtrain tasks in a two-year period. Therefore, some of the learning objectives for the overtrain tasks (e.g., those that are less important to safety and have not been shown to be areas of weakness) may have to be presented on a frequency less often than once every two years (e.g., once every 3 years).

At low-hazard nuclear facilities it is possible that none of the tasks would be selected as overtrain tasks or the number of overtrain tasks may be very small. In this case, the fixed portion of the continuing training program may be based primarily on regulatory training. The number of pre-train tasks is normally small and these tasks are performed infrequently enough that they can easily be accommodated in the continuing training program schedule if they are identified early and are well planned.

When an analysis other than a job analysis is performed, the continuing training program should be based on the activities/competencies which, if performed incorrectly, would have an impact on safety and require continued practice or performance to maintain proficiency.

Regulatory compliance training. Regulatory compliance training should be part of the fixed component of the continuing training program. This is the mandated training required by DOE Orders and Federal Regulations, such as security training and Occupational Safety and Health Act (OSHA) training, and can readily be scheduled well in advance. Training personnel should monitor DOE Orders, Federal Regulations, and special reports for information and changes in requirements influencing training. These changes should be incorporated into the continuing training program and also documented and tracked.

General employee training. Changes to the General Employee Training (GET) should be part of the continuing training program for all facility personnel. An exact repeat of the GET

received during the initial training is not required. Instead, any changes that may have occurred to the topic areas addressed in the initial GET program should be included in the continuing training program.

Trainee proficiency should be measured periodically by administering examinations on the areas of the GET program that were included in the continuing training program.

Fundamentals training. Continuing training should include selected fundamentals or knowledge training. Basic knowledge, as well as specialized knowledge, can be lacking when infrequent operations occur or newly supplied equipment breaks down. Therefore, instructions on selected fundamental topics should be provided on a continuing basis. The topics chosen should maintain technical and/or operational knowledge and skills. The fundamentals portion of continuing training should be derived from analysis data, identified job deficiencies, examination results, and operating experiences.

Flexible Continuing Training

The content of the flexible component of a continuing training program should be based on feedback from line management, training evaluations, industry operating events, and changes to the facility and its procedures. The flexible portion of continuing training is a method for quickly updating personnel on changes to facility procedures, modifications to facility design, and recent industry or in-house operating experience. This information can be provided in different settings depending on the nature of the material. This portion of continuing training should keep personnel informed of changes to their jobs and keep them up-to-date on job-related industry events.

Items that could have an immediate impact on facility safety or reliability should be presented as soon as possible to the appropriate personnel. This may include presenting the information during the shift supervisor's pre-shift briefing. Management should emphasize the importance of the information and should communicate the management operational philosophy, standards, and concerns. All training provided should be documented, and attendance should be tracked to verify that all individuals receive the information provided by this means.

Individuals and teams should be assessed to determine their proficiency. Assessment methods include, but are not limited to, written examination, performance tests, laboratory exercises, simulator exercises, and oral evaluations. These assessments should be performed immediately after training, during the following weeks on the job if possible, or at the next continuing training cycle.

10. Technical training personnel shall demonstrate the ability to plan, conduct, and document an overall evaluation of a technical training and qualification program or activity, and report those results to management in a concise and effective manner.

a) Using DOE-STD-1070-94, Guidelines for Evaluation of Nuclear Facility Training Programs, describe the elements of an evaluation of a nuclear facility training program.

The objectives and criteria in appendix A to DOE-STD-1070-94 may be used individually by a person or collectively by a team to evaluate a specific objective or criterion or as a package to evaluate the entire training program. The objectives and criteria were designed to

accommodate either the single person approach or the team approach. Job aids (i.e., checklists and forms) that can be used by either a person or by a team to support training program evaluation will be developed and published separately.

Training program evaluations should be conducted through observation of the overall program and should answer the question: “Does the training program meet the objectives and criteria contained in this standard?” The following resources should be used when conducting training program evaluations:

- Facility policies, procedures, program descriptions, and records
- Training materials such as lesson plans, guides, student handouts, and tests
- Cognizant facility personnel

Evaluations should be conducted at the facility, at the training center, and at other locations where training activities occur. Evaluations should center around three major activities to determine the extent to which training programs are meeting the objectives and criteria. These activities include observation of training, personnel interviews, and document reviews.

Observation of training should focus on the people (both instructors and trainees), the instructional environment, and the instructional process. The key steps involved in the observation of training are listed below:

- Select the training to be observed, obtain a copy of the lesson plan or guide, and review it prior to the observation.
- Explain the purpose of the observation to the instructor and attend training (but do not participate in the discussion or minimize trainee attention to the observation).
- Take detailed notes during the observation and write only facts.
- Compare the facts observed with the desired behaviors or conditions.
- Note any strengths and/or weaknesses.

Interviews require a different set of skills to acquire information about training. Successful interviewing is dependent on both speaking and listening skills, and on good questioning techniques. Key considerations during the interviewing process include the following:

- Pre-interview activities. Decide on goals for the interview, determine the key personnel who would provide the most complete and accurate information, and develop a set of questions in advance.
- Interview activities. Explain the interview purpose and answer any questions the interviewee may have, use open-ended questions to obtain detailed information, use closed questions to obtain short answer conclusions, assess throughout the interview, express appreciation for interviewee’s time, and restate the purpose of the interview at its conclusion.
- Post-interview activities. Compare responses to the objectives and criteria, and assess once again whether the information provided helped to accomplish the original goal(s) of the interview.

Training records should be reviewed to verify that materials and activities are being properly documented, processed, and retained. Program-level records include task lists, lesson plans, instructor qualifications, and program evaluations. Trainee-level records include attendance records, test results, qualification cards, and certifications. When inconsistencies exist, further investigation should be conducted to determine the depth of the problem. Assess the

system as a whole. Are the records properly validated and entered into the system in a timely manner? Is there an effective document control system? Are all the records in the system and are they readily retrievable?

- b) Establish the criteria to be used as a basis for conducting the evaluation.**
- c) Establish points of contact with the organization being evaluated.**
- d) Gather information pertinent to the evaluation by reviewing training materials, interviewing personnel, observing training activities, and reviewing training records.**
- e) Document the results of the data collection phase in field notes.**
- f) Compare the results of the review phase with the criteria established for the evaluation and determine if deficiencies exist.**
- g) Document the results of the overall training and qualification evaluation in a formal written report that includes the status of meeting the established criteria, identifies deficiencies or good practices, and suggests recommendations for improvement.**
- h) Resolve conflicting or inconclusive observations or findings obtained from other evaluators on an evaluation team.**
- i) Verbally report the results of the evaluation to contractor facility management and DOE management.**
- j) Perform follow-up activities as applicable to ensure implementation of corrective actions, including tracking and close-out.**
- k) Describe the process for determining and calculating a return on investment for a given training course or program.**

Elements “b” through “k” are performance-based competencies. The qualifying official will evaluate the completion of these competencies.

11. Technical training personnel shall demonstrate a working-level knowledge of the principles and functions of the Integrated Safety Management System (ISMS) and how integrated safety management (ISM) contributes to personnel competence.

- a) Describe how the guiding principles in the ISM Policy are used to implement an ISM philosophy in Headquarters and field element technical training activities.**

The Functions, Responsibilities, and Authorities Manual (FRAM) addresses the third guiding principle, Competence Commensurate with Responsibilities, by assigning each DOE element the responsibility for ensuring that its employees are qualified to perform their assigned functions. The Assistant Secretary for Management and Administration (MA-1) is assigned responsibility for assisting DOE line managers in recruiting and retaining highly qualified technical personnel.

The ISMS should ensure that personnel are competent commensurate with their responsibility for safety. This core expectation supports the principle of Competence

Commensurate with Responsibility. The ISMS should ensure that personnel possess the experience, knowledge, skills, and abilities necessary to discharge their responsibilities.

Support and line personnel — workers as well as managers — should have core competencies. Actual competence as well as the programs to define expectations, provide training, and evaluate whether expectations are met, should be addressed. The process for determining the required competence should consider the roles and responsibilities of each position and the knowledge and the performance of the incumbents.

b) Describe the core safety management functions in the ISM Policy and discuss how they provide the necessary structure for Headquarters and field element technical training activities.

The five core safety management functions are define scope of work, analyze hazards, develop and implement controls, perform work, and feedback and improvement. Following is a brief description of each of the core safety management functions.

Define Scope of Work

DOE and the contractor identify and prioritize work and allocate resources. The contractor's role in this core function is generally to translate broad missions into specific work packages. DOE provides performance expectations by strategic plans, goals, and objectives, and through program execution guidance.

A well-defined scope of work is critical to the success of a safety management system (SMS) because it

- sets the stage for the scope and depth of hazards identification/analysis
- is the foundation for the budget formulation/allocation process
- is the primary factor in establishing expectations and accountability

A fundamental objective of core function 1, define the scope of work, is to identify the scope, schedule, and costs of activities necessary to achieve DOE missions and expectations in a safe and environmentally sound manner.

The work scope should include those activities (such as fire protection, radiation protection, chemical hazards protection, training, etc.) that are necessary to control hazards associated with the work.

Some examples of actions that managers may take to promote worker involvement in planning include the following:

- Provide training for supervisors, managers, and work planners regarding effective use of worker input.
- Define and incorporate into written procedures the mechanisms for incorporating worker involvement and input to the work planning processes.
- Involve workers early in the planning process.
- Involve workers directly in the preparation and review of planning documentation and job hazard analysis, and ensure that planners incorporate input from workers on proposed work methods, hazards, and controls.

Analyze Hazards

The objective of hazards analysis is to develop an understanding of the potential for the hazard to affect the health and safety of the worker, the public, and the environment. Hazard controls are then established based on this understanding and other factors related to the work. The analysis includes two steps: (1) identifying and categorizing the hazard, and (2) analyzing accident scenarios related to hazardous work. In identifying hazards at the task/activity level, workers are a valuable resource for their knowledge of the process and its hazards. Categorization may address the character of the work (nuclear, chemical, thermal, electrical, and kinetic [motion]) and the magnitude of the hazard. Several other methods (e.g., checklist, “what-if,” hazard and operability [HAZOP] study, failure modes and effects analysis [FMEA]) are also suited to particular work environments and/or hazard magnitudes.

Develop and Implement Controls

The terms and conditions that define DOE safety expectations for its contractors are set forth as contract requirements. DEAR 970.5204-2 requires the contractor to comply with the requirements of applicable federal, state, and local laws and regulations, including DOE regulations in developing and implementing controls, unless the appropriate regulatory agency has granted relief in writing. DOE has identified safety requirements in rules and DOE Orders and has developed a wide variety of associated technical standards, guides, and manuals. In addition, DOE encourages the use of national consensus technical standards.

Specific controls derived from the agreed-upon set of standards and requirements may take several forms: engineered controls, written procedures, or other administrative controls. The form selected should be tailored to the hazard or importance of the desired attribute and, again, should be determined by line management responsible for the work based on safety/hazard analyses. The knowledge, skills, and abilities of the work force should be considered when selecting the form of controls. DOE and contractor agreement on the safety envelope is required as a condition for authorizing operations to proceed.

Once a set of controls has been established, processes should be provided for maintaining work performance within the safety envelope established in the safety/hazard analysis. The processes should clearly identify the controls used to establish the safety envelope. Some contractors achieve this objective by using work packages, job plans, maintenance plans, and technical safety requirements (TSRs) (nuclear facilities). A process to review, approve, and provide change control of the safety envelope should exist.

Perform Work

DOE and the contractor identify and implement safety controls before starting to work. Once work begins, it is performed in accordance with those safety controls.

Accordingly, each contractor’s ISMS should have a process to confirm adequate preparation, including adequacy of controls, prior to authorizing work to begin at the facility, project, or activity level. DEAR 970.5223-1(b)(7) requires that DOE and the contractor establish and agree upon the conditions and requirements to be satisfied for operations to be initiated and conducted.

These conditions and requirements are included in the contract and are therefore binding upon the contractor. The formality and rigor of the review process and the extent of documentation and level of authority for agreement should be based on the hazard and complexity of the work being performed. The process should ensure programs addressing all applicable functional areas are adequately implemented to support safe performance of the work.

Typically, contractors use a system of written policies, manuals, and procedures to ensure safety controls are integrated into work plans. At the work level, consideration must be given to controls necessary for worker protection. Individual work plans, operating procedures, and maintenance procedures are often used to implement safety controls at the task level. The following should be factored into the selection of worker safety controls:

- Hands-on training, safety awareness training, and the identification of necessary personal protective equipment (PPE), which are vital in familiarizing a worker with job duties, hazards, and controls
- Pre-job briefings and walkdowns, which provide a good opportunity to ensure workers are aware of hazards and knowledgeable on the proper use of prescribed controls
- Worker input, which should be solicited because workers can offer creative solutions for controlling hazards in a safe yet practical and cost effective manner

Feedback and Improvement

Feedback and improvement complete the ISMS loop by connecting practical experiences of work conducted to planning for future work. The feedback and improvement function is intended to

- identify and correct processes or deviations that lead to unsafe or undesired work outcomes
- confirm that the desired work outcomes were obtained safely
- provide managers and workers with information to improve the quality and safety of subsequent similar work

Mechanisms that support these goals include worker and management observations, pre- and post-work review meetings, quality and safety issue resolution processes, issue tracking systems, performance indicators, lessons learned, internal and external assessments, operational and strategic planning, and a variety of other such activities. It is necessary for each of these mechanisms to use information from the others to derive maximum benefit from the feedback and improvement safety management function.

- c) Discuss the role of the technical trainer in the fulfillment of the third ISM principle, Competence Commensurate with Responsibility, ensuring that personnel “possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.”**

See element “a” in this competency for a discussion of the third ISM principle.

- d) Identify specific and significant site or Headquarters work activities where the third ISM principle has been applied to improve safety.**
- e) Describe and cite examples of how technical training personnel contribute to the ISM function, Provide Feedback and Continuous Improvement, such as with lessons learned programs.**

- f) **Review and revise an existing training program or course to incorporate applicable ISM principles, functions, and/or practices.**

Elements “d” through “f” are performance-based competencies. The qualifying official will evaluate the completion of these competencies.

12. Technical training personnel shall demonstrate a working-level knowledge of DOE O 360.1B, Federal Employee Training, DOE M 360.1-1B, Federal Employee Training Manual, and DOE M 426.1-1, Federal Technical Capability Manual, sufficient to ensure that training programs for federal personnel are accomplished in accordance with the requirements of the Order.

- a) **Discuss the duties and responsibilities of line management, headquarters personnel, and training support personnel as indicated in the Order and manual.**

Line Management Duties and Responsibilities

The duties and responsibilities of site managers include the following:

- Approve training policies and procedures for their DOE element
- Prioritize critical needs, provide resources for, plan, assess, and report on training consistent with DOE strategic planning, budget, succession planning, and training administration processes, with specific attention to
 - requirements of statutes, regulations, and DOE directives
 - DOE strategic plan and mission goals and objectives
 - governmental and DOE-wide policy and management functions
 - scientific and technical personnel and related materials, work processes, security, safety, health, environmental, nuclear, and technical operations needs
 - manager, supervisor, and team leader training appropriate to the duties and responsibilities of their positions and succession planning needs
- Define mandatory training requirements for employees in their element, including manager and supervisor training among other responsibilities
- Ensure efficient and effective management of training programs for their site’s workforces
- Designate training approval and authorization officials for their DOE site
- Assign responsibilities for training requirements and functions, including designation of a training official(s) and a DOE point of contact and an alternate for training programs
- Approve their site’s participation in training agreements governing multi-site programs
- Approve training agreements for their own site’s programs, agreements with other DOE sites on one-to-one basis, and local geographic area interagency and intergovernmental training-related agreements
- Provide subject matter experts to meet training program requirements
- Waive training completion and continued service obligations for federal employees prior to separation from DOE, as appropriate
- Approve acceptance of training-related awards, honorariums, and/or other contributions toward costs of training from Internal Revenue Service recognized 501(c)(3) organizations, with advice from the Office of General Counsel, as required

Headquarters Personnel Duties and Responsibilities

The duties and responsibilities of Headquarters personnel include the following:

- The Secretary approves training requests for Presidential appointees, and concurs in training assignments involving the White House, Office of Management and Budget, and the Congress prior to the beginning date of the training.
- The Administrator for Nuclear Security or Designee is responsible for approving training agreements governing multi-site workforce development programs (three or more participating sites, research designed to improve DOE-wide training programs, and personnel management related authorities used under training agreements).

Training Support Personnel Duties and Responsibilities

The duties and responsibilities of training support personnel include the following:

- Manage assigned training functions, including, but not limited to
 - training compliance with applicable laws, regulations, policies, requirements, and provisions of training agreements
 - training policy and program development
 - training program cooperation and liaison with other DOE elements
 - training program evaluation and self-assessment
- Approve and coordinate additional approvals, authorizations, and/or concurrences for training for any federal employee if officials with responsibility for that employee's training are not located at that duty station

b) Explain the latitude and restrictions associated with employee training.

Resources can only be invested in training when

- the training provides a structured approach to acquiring information, knowledge, skills, and/or developmental experience;
- the training is required by law, DOE directive, or head of element mandate, is related to performance improvement, or contributes to maintaining a highly skilled, diverse, and versatile workforce;
- the purpose and subject matter of the training are related to DOE's mission or benefit the federal government any time that the goals of the training include placement in another federal agency;
- it is expected that the training participant will use the competencies learned to perform current or anticipated duties after completion of the training for a period at least equal to the duration of the training or an applicable continued service obligation.

No training funds can be expended for licenses, certificates, and other types of recognized occupational qualification tests or examinations. This restriction does not affect the use of examinations that are integral to training, that test participant learning related to the training, that must be accomplished successfully to meet training completion requirements, and that incidentally qualify an individual or group, in whole or in part, for a license or certificate.

Training that purposely leads to an academic degree must be provided only under a training agreement consistent with the provisions of 5 CFR 410.308. This restriction does not limit otherwise authorized training that incidentally provides credit toward a degree, certification, or other academic or professional recognition.

If a supervisory, approving, or authorizing official becomes aware that a training assignment, program, or location is inconsistent with (1) DOE policy or program interests or responsibilities; (2) required provision of accommodations for handicapped individuals; (3) equal employment opportunity requirements; or (4) religious or strongly held personal values of a participant(s), the official must take action to resolve such inconsistencies and/or terminate the training or, in the case of conflict with strongly held religious or personal values, allow an individual(s) to withdraw from the training, with appropriate waiver of training completion requirements.

c) Describe the requirements for training plans, resources, and reports.

Each DOE element must have training policies and/or procedures that establish an integrated cycle of organizational needs analysis and training needs assessment, planning, resource allocation, design and delivery, evaluation, and reporting processes which are consistent with the requirements and responsibilities of DOE M 360.1-1B and include, but are not limited to, the following:

- Official(s) designated to approve training requests, other than first-line supervisors
- Official(s) designated to authorize training requests, limitations of such authorities, and concurrences required
- Official(s) responsible for training program management, such as the completion of element training plans, the conduct of needs assessments and evaluations, and oversight of developmental assignments
- Annual review and revision of individual development plans
- Continued service obligation conditions imposed by the DOE element
- Procedures for waiver of training completion and continued service obligations
- Employee obligations (i.e., individual development planning, initiation of training requests, completion and evaluation of training, and continued service obligations)
- Procurement authorities delegated to training management officials
- Employee training and training program records creation, maintenance, and disposition

Each DOE element must, within 3 months of the close of the fiscal year, complete an annual training summary report on objectives, costs, and incidents of training that describes at least the following:

- Accomplishments in relation to critical needs, goals, objectives, and training outcome and performance measures
- Training expenditures compared to the number of federal training staff, training staff travel funds, and program funds budgeted
- Annual information as requested, such as
 - the number of employees in the workforce
 - the training office or organization staff cost
 - the total expenditure for purchased training goods and services
 - total duty hours and non-duty hours in training
 - total duty hour and non-duty hour training incidences
 - the cost of participant salaries while in training
 - training-related travel
 - organizational, functional, and occupational needs assessments completed and percent of employees with individual development plans

DOE elements that provide training under training agreements must have a specific, separate component of their annual summary report that describes the training.

The Office of Training and Human Resource Development must prepare an annual training summary report describing costs, instances, and accomplishments relative to critical, training-related DOE mission objectives and DOE-wide training goals and needs.

d) Explain the requirements associated with requesting and using training resources as described in the Order.

Training requests must be initiated, approved, and authorized in accordance with the element's training policy and/or procedures or applicable training agreement (e.g., the training participant ensures completion of the request, a supervisory official approves it, and a designated official authorizes it).

Training participants must complete the training, provide evaluations to the appropriate training official and supervisory official, and meet applicable continued service obligations.

e) State the purpose and requirements associated with establishing workforce development programs with employees.

The purpose of workforce development programs is to meet organizational and/or work performance objectives based on management's determination that the nature or quantity of work or the composition of the workforce requires improvement in workforce competency levels and/or reassignment of individuals to meet current or new requirements. This includes training programs under DOE training centers of excellence, academic degree training, work experience or developmental training assignments at non-federal sites or organizations, and career transition training, including those programs designed to place DOE employees in positions potentially available in other federal agencies.

Types of Workforce Development Programs

External. The external programs are managed by organizations outside of DOE. DOE elements participate under their own policies and procedures within the framework established by the external organization providing the training and development program (for example, Executive Potential or Congressional Fellows programs).

Internal. The internal programs are managed within individual DOE elements or on a multi-element (three or more elements) basis by one or more DOE elements, including those programs under training centers of excellence. Internal workforce development programs require a training agreement that includes an implementation plan.

Approval of Training Agreements Governing Workforce Development Programs

Element programs. The head of a DOE element must approve training agreements governing element workforce development programs, i.e., programs where 80 percent or more of the resources, participants and/or positions affected are projected to come from a single DOE element or, by mutual agreement, involve primarily two DOE elements.

Multi-element programs. The Director, Management, Budget and Evaluation (and/or NNSA designee, if applicable), must approve training agreements involving employees and/or positions in three or more DOE elements, including training centers of excellence, where less than 80 percent of the resources or fewer than 80 percent of the affected employees and/or positions are in one DOE element.

Programs funded and approved as part of the DOE strategic plan and/or budget process may be considered as having the equivalent of a training agreement; however, the Director, Management, Budget and Evaluation (and/or NNSA designee, if applicable) must approve an implementation plan for such DOE multi-element programs.

Minimum Contents of Training Agreements

Training agreements must include

- current conditions or circumstances requiring changes in workforce competencies and/or deployment;
- the purpose, objectives, and expected measurable outcomes of the program;
- the names of the parties to the agreement, including training official(s), human resource director(s), program official(s), the governing body or board, and their roles and responsibilities;
- a detailed implementation plan.

Minimum Contents of Training Agreement Implementation Plans

An implementation plan must include

- federal staffing requirements to manage the training program;
- the projected current year costs and multi-year cost estimates, where applicable;
- the projected source, number, grade levels, series, and experience levels of participants;
- the projected time schedule of major activities, including beginning dates and end dates;
- human resource management and development authorities to be used in the training program, including the use of academic degree training authority, as applicable;
- pre-announcement information, the announcement process, application procedures, and conditions of participation, as appropriate;
- procedures to implement training program management responsibilities which require that
 - participants must have individual development plans related to program objectives and implementation actions;
 - participants must have performance requirements related to program objectives and implementation actions;
 - the program must have criteria for participant and supervisor evaluation of training and performance-related outcomes of training;
 - a senior line management official or training official must be designated as responsible for management of the program by the head of each participating DOE element;
 - the training and work performance of individuals in the program must be formally assessed at least every 6 months;
 - continued service obligation documentation must be completed by all participants prior to their program beginning date, as applicable;
 - the governing authority or body must ensure that the implementation plan is reviewed and revised annually and that the annual summary report is completed.

f) Describe the requirements of the Federal Technical Capability Program (FTCP), including the Technical Qualification Program.

The objective of the FTCP is to recruit, deploy, develop, and retain federal employees with the necessary technical capabilities to safely accomplish the Department's missions and responsibilities. The Department has identified guiding principles to accomplish that objective and identified four general functions of the FTCP. As stated in the Department's Integrated Safety Management Guiding Principles

- federal personnel possess the experience, knowledge, skills, and abilities that are necessary to discharge their safety responsibilities;
- line managers are accountable and have the responsibility, authority, and flexibility to achieve and maintain technical excellence;
- supporting organizations (personnel, training, contracts, finance, etc.) recognize line managers as customers and effectively support them in achieving and maintaining technical capabilities;
- an integrated corporate approach is required to ensure that necessary technical capabilities and resources are available to meet the overall needs of the Department's defense nuclear facility missions.

Training, education, and experience combine to provide a workforce that ensures safe operation of defense nuclear facilities. The Technical Qualification Program (TQP) establishes a process to objectively determine that individuals performing activities related to the technical support, management, oversight, or operation of defense nuclear facilities possess the necessary knowledge, skills, and abilities to perform their assigned duties and responsibilities.

The TQP specifically applies to DOE technical employees whose duties and responsibilities require them to provide assistance, guidance, direction, oversight, or evaluation of contractor activities that could impact the safe operation of a defense nuclear facility. This includes employees designated as safety system oversight personnel, facility representatives, senior technical safety managers, and employees on detail or temporary assignment.

The objectives of the TQP are as follows:

- Identify and document the functional competencies that individual employees must possess to ensure that DOE defense nuclear facilities and programs are operated in accordance with applicable safety, health, and environmental requirements.
- Establish a program that clearly identifies and documents the process used by senior line management to demonstrate employee technical competence, consistent with applicable industry standards for similar occupations.
- Ensure that employees maintain their technical competencies.
- Maintain a cycle of continuous performance improvement through structured, individualized training and development programs and through review and assessment of Headquarters and field element programs.

g) Conduct a gap analysis of the requirements of the above directives regarding how or whether they are being implemented in the assigned organization.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

13. Technical training personnel shall demonstrate a working-level knowledge of the content and applicability of the DOE resources and guidance documents related to the implementation of DOE federal and contractor training programs.

a) Describe the general content and explain the use and applicability of the DOE guides to good practice for training and qualification programs and processes.

The DOE handbook, DOE-HDBK-1078-94, Training Program Handbook: A Systematic Approach to Training, describes a systematic method for establishing and maintaining training programs that meet the requirements and expectations of DOE Orders 5480.18B, Nuclear Facility Training Accreditation Program, and 5480.20, Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities. The systematic approach to training (SAT) includes five distinct, yet interrelated, phases. These phases include analysis, design, development, implementation, and evaluation. SAT is consistent with other systematically based training systems such as performance-based training (PBT), training system development (TSD), instructional systems development (ISD), and other similar methods. The systematic approach method may also be used in conjunction with other DOE Orders and directives that contain personnel training and qualification requirements.

This handbook describes the more classical concept and approach to systematically establishing training programs. However, in some cases this approach has proven to be time- and labor-intensive, especially if excessive detail is expected. The risk and complexity associated with performance of a job or the nuclear hazard category of the facility affected may warrant the use of simpler, less detailed alternative methods to achieve results that are both satisfactory and effective. These methods are discussed in other Departmental and industry standards.

Users of this handbook should consider the variety of training options that are available for establishing and maintaining personnel training and qualification programs. Blending classical and alternative systematic approaches to training methods often yields the most effective product. Finally, users should emphasize the fundamental goal of any training program as they use this handbook; that is, to prepare workers to do their jobs safely, efficiently, and effectively, and to protect the work force, the public, and the environment.

DOE-HDBK-1118-99, Guide to Good Practices for Continuing Training, provides guidance to DOE staff and contractors that can be used to modify existing continuing training programs or to develop new programs. DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, chapter I, paragraph 7.d, requires each facility to design and implement a continuing training program for all operating organization personnel who perform functions associated with engineered safety features. Continuing training is necessary to ensure that operating organization personnel continually improve their ability to operate, maintain, and provide support to their nuclear facility(ies) in a safe and reliable manner. Continuing training should also enhance the professionalism of these individuals and should make them aware of the possible consequences of misoperation. DOE contractors should not feel obligated to adopt all parts of this guide. Rather, they can use the information in this guide to develop programs that

apply to their facility. This guide can be used as an aid in the design, development, and evaluation of a facility's continuing training program.

DOE-HDBK-1001-99, Guide to Good Practices for Training and Qualification of Instructors, contains good practices for the training and qualification of technical instructors and instructional technologists at DOE reactor and non-reactor nuclear facilities. It addresses the content of initial and continuing instructor training programs, evaluation of instructor training programs, and maintenance of instructor training records.

The Guide to Good Practices for Training and Qualification of Instructors was developed from three principal sources:

- Commercial nuclear power industry guidelines for instructor training and qualification
- The Mid-Atlantic Nuclear Training Group (MANTG) Generic Instructor Task List
- A tabletop analysis conducted to identify instructional competencies representative of those required by DOE's Training Accreditation Program (TAP) objectives and criteria

The TAP objectives and criteria have been revised since this guide was originally developed. They are now consistent with the objectives and criteria contained in DOE-STD-1070-94, Guidelines for Evaluation of Nuclear Facility Training Programs, which establishes the standards against which training programs should be evaluated. The competencies in this guide are representative of those required by the revised objectives and criteria of the accreditation program and DOE-STD-1070-94.

Training programs at DOE facilities should prepare personnel to safely and efficiently operate and maintain the facilities in accordance with DOE requirements. DOE-HDBK-1206-98, Guide to Good Practices for On-the-Job Training, presents good practices for performance-based on-the-job training and OJT programs.

b) Research such professional sources as the American Society for Training and Development (ASTD), American Nuclear Society (ANS), and American National Standards Institute (ANSI), as may be found on the Internet, for applicable technical training and qualification information and materials; incorporating the research results into an assigned training project or program.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

14. Technical training personnel shall demonstrate a working-level knowledge of the requirements of applicable DOE Orders and rules to determine if a contractor at a facility is implementing effective training and qualification programs.

- a) Referring to the following sample of Orders and rules, describe the purpose, applicability, and roles and responsibilities as they pertain to oversight of contractor training and qualification programs.**
- 10 CFR 820, Procedural Rules for DOE Nuclear Activities
 - 10 CFR 830, Nuclear Safety Management
 - 10 CFR 835, Occupational Radiation Protection

- **DOE Order 5480.19, Conduct of Operations Requirements for DOE Facilities**
- **DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities**
- **DOE O 151.1C, Comprehensive Emergency Management System**
- **DOE O 350.1, Contractor Human Resource Management Programs**
- **DOE O 414.1C, Chg 1, Quality Assurance**
- **DOE O 425.1C, Start-up and Restart of Nuclear Facilities**
- **DOE O 430.1B, Real Property Asset Management**

10 CFR 820, Procedural Rules for DOE Nuclear Activities

Title 10 CFR 820.2 defines “DOE Nuclear Safety Requirements” as “the set of enforceable rules, regulations, or orders relating to nuclear safety adopted by DOE (or by another Agency if DOE specifically identifies the rule, regulation, or order) to govern the conduct of persons in connection with any DOE nuclear activity and includes any programs, plans, or other provisions intended to implement these rules, regulations, orders, a nuclear statute or the Atomic Energy Act, including technical specifications and operational safety requirements for DOE nuclear facilities. For purposes of the assessment of civil penalties, the definition of DOE Nuclear Safety Requirements is limited to those identified in 10 CFR 820.20(b).” Section 820.20(b) states that civil penalties may be assessed on the basis of a violation of any DOE nuclear safety requirement, a compliance order, or any program, plan, or other provision required to implement such requirement or compliance order.

10 CFR 830, Nuclear Safety Management

Title 10 CFR 830.120 establishes quality assurance requirements for contractors conducting activities, including providing items or services that affect, or that may affect, the nuclear safety of DOE nuclear facilities. This includes requirements for a contractor’s quality assurance program.

Title 10 CFR 830.200 establishes safety basis requirements for hazard category 1, 2, and 3 DOE nuclear facilities. This includes requirements related to unreviewed safety questions, technical safety requirements, and documented safety analyses.

10 CFR 835, Occupational Radiation Protection

The rules in this part establish radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities. Some of the topics covered in this regulation are listed below:

- Radiation protection programs
- Internal audits
- Occupational dose limits for general employees
- Individual monitoring
- Air monitoring
- Radiological areas
- Labeling items and containers
- Radiation safety training
- Facility design and modifications
- Workplace controls
- Nuclear accident dosimetry

DOE Order 5480.19, Conduct of Operations Requirements for DOE Facilities

The purpose of this Order is to provide requirements and guidelines for Departmental elements, including the NNSA, to use in developing directives, plans, and/or procedures relating to the conduct of operations at DOE facilities. The implementation of these requirements and guidelines should result in improved quality and uniformity of operations.

These guidelines have been written to assist facilities in meeting operations performance and safety objectives. It is intended that they be used to review existing or planned programs or facilities and in developing programs where none presently exist. It is expected that facilities may use different approaches or methods than those defined in the guidelines, but facilities are expected to meet the intent of these guidelines. Some expansion of the intent of the guidelines is provided in the introduction and discussions section for each chapter, and the specific guidelines that follow reflect generally accepted methods for conducting operational activities. Deviation from any particular guideline would not in itself indicate a problem in operation. However, differences between the guidelines and actual practices should be reviewed to determine if a facility practice should be changed. A change in facility practice would be appropriate if a performance weakness is determined to exist. It is recognized that these guidelines cross into areas covered by multiple DOE Orders (e.g., DOE Order 5480.4 or DOE Order 5500), which need to be used on an equal basis. During the development of this guideline, no specific guidance was found which conflicts with other DOE Orders. If a user finds any conflicts, the matter should be resolved by the Program Manager or the field office and identified to the Office of Environment, Safety and Health.

These guidelines are also intended to be useful to Program Managers and field offices responsible for oversight of facility operations. In particular, these guidelines could be used to assess the effectiveness and adequacy of policies and actions in the areas addressed. Groups reviewing facility performance could use this document as a reference to support some aspects of their activities. It is therefore incumbent upon Program Managers, field offices, and facility management to review their operations and determine and document specific facility conformance with the guidelines.

Each chapter of these guidelines is organized into three sections. The Introduction briefly describes the objective to be achieved and describes, where needed, the relationship of the chapter to other chapters. This is followed by a Discussion section that concisely describes the actions needed to accomplish the objectives and includes a brief explanation of why these actions are necessary or important. The final section, the guidelines themselves, provides specific guidance for meeting the chapter objectives. In some cases, example situations accompany the guidelines. Such examples should not be construed as the only method for meeting the intent of the guidelines. The Order is organized into the following 18 chapters:

- Chapter I. Operations Organization and Administration
- Chapter II. Shift Routines and Operating Practices
- Chapter III. Control Area Activities
- Chapter IV. Communications
- Chapter V. Control of On-Shift Training
- Chapter VI. Investigation of Abnormal Events
- Chapter VII. Notifications
- Chapter VIII. Control of Equipment and System Status

- Chapter IX. Lockouts and Tagouts
- Chapter X. Independent Verification
- Chapter XI. Logkeeping
- Chapter XII. Operations Turnover
- Chapter XIII. Operations Aspects of Facility Chemistry and Unique Processes
- Chapter XIV. Required Reading
- Chapter XV. Timely Orders to Operators
- Chapter XVI. Operations Procedures
- Chapter XVII. Operator Aid Postings
- Chapter XVIII. Equipment and Piping Labeling

DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities

The purpose of this Order is to establish selection, qualification, and training requirements for M&O contractor personnel involved in the operation, maintenance, and technical support of DOE/NNSA category A and B reactors and non-reactor nuclear facilities.

DOE objectives are to ensure the development and implementation of contractor-administered training programs that provide consistent and effective training for personnel at DOE nuclear facilities. This Order contains minimum requirements that must be included in training and qualification programs. The requirements are based on DOE, Nuclear Regulatory Commission (NRC), and related industry standards, and are applicable to all operable DOE nuclear facilities. Because the operation of DOE reactor and non-reactor nuclear facilities involves certain risks to employees, the public, and the environment, well-trained and qualified operating organization personnel are of extreme importance. A vital element in ensuring a well-trained and qualified work force is the implementation of an SAT. This approach has proven effective in the commercial nuclear power industry and in other major industries; therefore, the Department requires that training programs for personnel in the operating organization at DOE nuclear facilities are established using an SAT. Experience has also shown that the better operating nuclear facilities have well-defined, effectively administered policies and procedures to control the activities associated with personnel training. This Order requires the establishment and implementation of certain training-related procedures. Implementation of the requirements of this Order will meet 10 CFR 830.120, Criteria 2 — Personnel Training and Qualification.

This order contains chapters that delineate general and specific requirements that apply to M&O contractor operating organization personnel. Chapter I contains requirements that have broad applicability for training and qualification of personnel at all operable nuclear facilities. Chapters II, III, and IV contain requirements for personnel at DOE category A production, test, and research reactors, category B reactors, and non-reactor nuclear facilities, respectively.

DOE O 151.1C, Comprehensive Emergency Management System

The purpose of this Order is

- to establish policy and to assign and describe roles and responsibilities for the DOE Emergency Management System. The Emergency Management System provides the framework for development, coordination, control, and direction of all emergency planning, preparedness, readiness assurance, response, and recovery actions. The Emergency Management System applies to DOE and to the NNSA.

- to establish requirements for comprehensive planning, preparedness, response, and recovery activities of emergency management programs or for organizations requiring DOE/NNSA assistance.
- to describe an approach to effectively integrate planning, preparedness, response, and recovery activities for a comprehensive, all-emergency management concept.
- to integrate public information and emergency planning to provide accurate, candid, and timely information to site workers and the public during all emergencies.
- to promote more efficient use of resources through greater flexibility (i.e., the graded approach) in addressing emergency management needs consistent with the changing missions of the Department and its facilities.
- to ensure that the DOE Emergency Management System is ready to respond promptly, efficiently, and effectively to any emergency involving DOE/NNSA facilities, activities, or operations, or requiring DOE/NNSA assistance.
- to integrate applicable policies and requirements, including those promulgated by other federal agencies (e.g., stockpiling stable iodine for possible distribution as a radiological protective prophylaxis), and interagency emergency plans into the Department's Emergency Management System. In compliance with the statutory requirements in 42 USC 7274k, DOE finds that this Order is necessary for the fulfillment of current legal requirements and conduct of critical administrative functions.
- to eliminate duplication of emergency management efforts within the Department.

DOE O 350.1, Contractor Human Resource Management Programs

The objectives of this Order are

- to establish DOE responsibilities, requirements, and cost allowability criteria for the management and oversight of contractor Human Resource Management (HR) programs.
- to ensure that DOE contractors manage their HR programs to support the DOE mission, promote work force excellence, champion work force diversity, achieve effective cost management performance, and comply with applicable laws and regulations.
- to implement consistent requirements that allow contractors flexibility in determining how to meet the requirements.
- to ensure that all elements of cash and non-cash compensation are considered in the design and implementation of an appropriate total compensation philosophy, but are not used as a means to deflect needed cost reductions in either or both.

Requirements are set forth in Chapters I through IX of this Order.

DOE O 414.1C, Chg 1, Quality Assurance

The objectives of this Order are

- to ensure that DOE/NNSA, products and services meet or exceed customers' expectations.
- to achieve quality assurance (QA) for all work based upon the principles
 - that quality is assured and maintained through a single, integrated, effective QA program (i.e., management system);
 - that management support for planning, organization, resources, direction, and control is essential to QA;
 - that performance and quality improvement require thorough, rigorous assessment and corrective action;

- that workers are responsible for achieving and maintaining quality;
- that environmental, safety, and health risks and impacts associated with work processes can be minimized while maximizing reliability and performance of work products.
- to establish quality process requirements to be implemented under a QA program (QAP) for the control of suspect/counterfeit items (S/CIs), safety issue corrective actions, and safety software.

Requirements for QAPs and the quality criteria are set forth in section 4a and 4b of this Order.

DOE O 425.1C, Start-Up and Restart of Nuclear Facilities

The purpose of this Order is to establish the requirements for the DOE/NNSA for startup of new nuclear facilities and for the restart of existing nuclear facilities that have been shut down. Nuclear facilities are activities or operations that involve radioactive and/or fissionable materials in such form or quantity that a nuclear hazard potentially exists to the employees or the general public. The requirements specify a readiness review process that must, in all cases, demonstrate that it is safe to start (or restart) the applicable facility. The facility must be started (or restarted) only after documented independent reviews of readiness have been conducted and the approvals specified in this Order have been received. The readiness reviews are not intended to be tools of line management to achieve readiness. Rather, the readiness reviews provide an independent confirmation of readiness to start or restart operations.

Requirements associated with operational readiness reviews are available in section 4 of this Order.

DOE O 430.1B, Real Property Asset Management

The purpose of this Order is to establish a corporate, holistic, and performance-based approach to real property life-cycle asset management that links real property asset planning, programming, budgeting, and evaluation to program mission projections and performance outcomes. To accomplish the objective, this Order identifies requirements and establishes reporting mechanisms and responsibilities for real property asset management. This Order implements DOE P 580.1, Management Policy for Planning, Programming, Budgeting, Operation, Maintenance and Disposal of Real Property, dated May 20, 2002.

b) Identify, retrieve, and prepare a summary of all the applicable Orders and rules for training and qualification oversight activities for a given DOE facility.

This is a performance-based competency. The local qualifying official will evaluate the completion of this competency.

c) State and describe the purpose and applicability of DOE-STD-1070-94, Guidelines for Evaluation of Nuclear Facility Training Programs.

The DOE Guidelines for Evaluation of Nuclear Facility Training Programs establishes a single set of objectives and criteria for the evaluation of training programs developed to meet the requirements of DOE Order 5480.20A and other directives that address training and qualification. For the purpose of this standard, evaluation includes appraisals, surveillances,

audits, reviews, assessments, and other activities intended to evaluate training. The standard is intended to assist personnel in performing evaluations of training and qualification programs. It should be used in conjunction with other regulations, policies, or directives that require the evaluation of training and qualification programs.

Purpose

The Guidelines for Evaluation of Nuclear Facility Training Programs establish objectives and criteria for evaluating nuclear facility training programs. The guidance in this standard provides a framework for the systematic evaluation of training programs at nuclear facilities and is based, in part, on established criteria for Technical Safety Appraisals, commercial nuclear industry evaluations, and the DOE Training Accreditation Program.

Applicability

This standard applies to organizations or persons involved in evaluating training methods, materials, and programs at DOE nuclear facilities. DOE nuclear facilities include category A reactor facilities, category B reactor facilities, and non-reactor nuclear facilities. The focus of the standard is evaluations that are conducted by DOE field organizations (Operations Office, Site Office, or Project Office as appropriate). It should also be used by others who conduct reviews of training, whether internal and external to the Department.

Training programs will vary according to the complexity and hazard potential of a particular nuclear facility. Consequently, certain criteria may not be applicable to low-hazard facilities; hence, a degree of flexibility must be used when applying the criteria. When a criterion is not applicable, it need not be considered.

While this standard assumes specific methods of evaluation, alternate methods that are consistent with overall organizational needs, policies, and resources are acceptable.

- d) Apply the evaluation process indicated in DOE-STD-1070-94, including evaluation methods, evaluation frequency, and the application of a graded approach to an assigned evaluation of a contractor's training program, and report the results.**

This is a performance-based competency. The local qualifying official will evaluate the completion of this competency.

- e) Describe the process for determining adequate compliance with the requirements listed in the above orders and rules and the severity and consequences associated with not being in compliance.**

The objectives and criteria in appendix A of DOE-STD-1070-94 may be used individually by a person or collectively by a team to evaluate a specific objective or criterion or as a package to evaluate the entire training program. The objectives and criteria were designed to accommodate either the single person approach or the team approach. Job aids (i.e., checklists and forms) that can be used by either a person or by a team to support training program evaluation will be developed and published separately.

Training program evaluations should be conducted through observation of the overall program and they should answer the question: "Does the training program meet the

objectives and criteria contained in this standard?” The following resources should be used when conducting training program evaluations:

- Facility policies, procedures, program descriptions, and records
- Training materials, such as lesson plans, guides, student handouts, and tests
- Cognizant facility personnel

Evaluations should be conducted at the facility, at the training center, and at other locations where training activities occur. Evaluations should center around three major activities to determine the extent to which training programs are meeting the objectives and criteria.

These activities include observation of training, personnel interviews, and document reviews. Observation of training should focus on the people (both instructors and trainees), the instructional environment, and the instructional process. Following are the key steps involved in the observation of training:

- Select the training to be observed, obtain a copy of the lesson plan or guide, and review it prior to the observation.
- Explain the purpose of the observation to the instructor and attend training (but do not participate in the discussion or minimize trainee attention to the observation).
- Take detailed notes during the observation and write only facts.
- Compare the facts observed with the desired behaviors or conditions.
- Note any strengths and/or weaknesses.

Interviews require a different set of skills to acquire information about training. Successful interviewing is dependent on both speaking and listening skills, and on good questioning techniques. Key considerations during the interviewing process include the following:

- Pre-interview activities. Decide on goals for the interview, determine the key personnel who would provide the most complete and accurate information, and develop a set of questions in advance.
- Interview activities. Explain the interview purpose and answer any questions the interviewee may have, use open-ended questions to obtain detailed information, use closed questions to obtain short answer conclusions, assess throughout the interview, express appreciation for interviewee’s time, and restate the purpose of the interview at its conclusion.
- Post-interview activities. Compare responses to the objectives and criteria and assess once again whether the information provided helped to accomplish the original goal(s) of the interview.

Training records should be reviewed to verify that materials and activities are being properly documented, processed, and retained. Program-level records include task lists, lesson plans, instructor qualifications, and program evaluations. Trainee-level records include attendance records, test results, qualification cards, and certifications. When inconsistencies exist, further investigation should be conducted to determine the depth of the problem. Assess the system as a whole. Are the records properly validated and entered into the system in a timely manner? Is there an effective document control system? Are all the records in the system and are they readily retrievable?

15. Technical training personnel shall demonstrate a working-level knowledge of basic assessment principles and processes associated with evaluating DOE contractors such as operational readiness reviews (ORRs), readiness assessments (RAs), and business management oversight reviews. This includes the planning and use of observations, interviews, and document reviews to assess compliance with established criteria or requirements.

a) Describe the role of the evaluator with respect to performance of oversight of contractors at government-owned, contractor-operated facilities.

The role of technical training personnel in the contractor performance evaluation process varies from site to site. The local qualifying official will evaluate the completion of this competency.

b) Describe the requirements and limitations associated with the evaluator's interface with contractor employees when conducting assessments or evaluations.

As assessment requirements and limitations associated with the interface of contractor employees vary from site to site, the local qualifying official will evaluate the completion of this competency.

c) Explain the impact of the Price-Anderson Amendments Act upon contractor oversight activities, particularly in the conduct of performance evaluations and enforcement actions associated with 10 CFR Parts 820, 830, and 835.

The Price Anderson Amendment Act (PAAA) of 1988 provides incentives for DOE contractors to abide by nuclear facility safety and operations requirements as set forth by DOE in such documents as 10 CFR 830. The 10 CFR 830 regulatory requirements are intended to revise and supplement the existing provisions in DOE Orders for nuclear safety and will provide a more direct means to implement the civil penalty provisions of the PAAA. The PAAA provides a reimbursement incentive to DOE contractors (and their subcontractors and suppliers) for conducting activities that involve source, special nuclear, or byproduct material in response to public liability penalties associated with the consequences of those activities.

A DOE technical training professional

- oversees and provides direction to the contractor for the preparation of implementation plans in response to the new rules;
- monitors the contractor's adherence to the rules;
- brings potential non-compliances to the attention of a supervisor or PAAA coordinator;
- assists DOE HQ in determining the contractor's liability and penalty, civil and/or criminal, for a violation.

d) Explain the essential elements of a performance-based assessment, including the areas of investigation, fact-finding, and reporting.

Investigation

It is important to begin the investigation as soon as an assessment is called for to ensure that data is not lost. The information that should be collected consists of: conditions before,

during, and after operation of the facility; personnel involvement; environmental factors; and other information having relevance to the operation of the facility.

Fact Finding

Once all the data has been collected, the data should be verified to ensure accuracy. The investigation may be enhanced if some physical evidence is retained. Establishing a quarantine area, or the tagging and segregation of pieces and material, should be performed for failed equipment or components. The basic need is to determine the direct, contributing, and root causes so that effective corrective actions can be taken that will prevent recurrence. Some areas to be considered when determining what information is needed include

- activities related to the operations of the facility
- initial or recurring problems
- hardware (equipment) or software (programmatic-type issues) associated with the facility
- recent administrative program or equipment changes
- physical environment or circumstances

Some methods of gathering information include conducting interviews and collecting statements. Interviews must be factual. Preparing questions before the interview is essential to ensure that all necessary information is obtained. Interviews should be conducted, preferably in person, with those people who are most familiar with the system. Individual statements could be obtained if time or the number of personnel involved makes interviewing impractical. Interviews can be documented using any format desired by the interviewer. Consider conducting a walk-through of the system or facility as part of the interview if time permits.

Reporting

Review of reports and documents helps develop the foundation for identifying weaknesses and areas that are of concern to an auditor.

Review relevant documents or portions of documents as necessary, and reference their use in support of facility operation. Record appropriate dates and times associated with the occurrence on the documents reviewed. Examples of documents include the following:

- Operating logs
- Correspondence
- Inspection/surveillance records
- Maintenance records
- Meeting minutes
- Computer process data
- Procedures and instructions
- Vendor manuals
- Drawings and specifications
- Functional retest specifications and results
- Equipment history records
- Design basis information
- Safety analysis report (SAR)/technical specifications
- Related quality control evaluation reports
- Operational safety requirements

- Safety performance measurement system/occurrence reporting and processing system (SPMS/ORPS) reports
- Radiological surveys
- Trend charts and graphs
- Facility parameter readings
- Sample analyses and results (chemistry, radiological, air, etc.)
- Work orders

e) Explain the purpose and contents of a typical assessment report, and describe how to determine who should be on the distribution list for the report.

Writing the report is documenting the result of an assessment. The purpose of a report is to provide documentation necessary to support findings and concerns identified by the assessor(s). The report should clearly state the status of reviewed areas and act as the reference for future discussions regarding corrective action plans.

Each assessment report will be unique, depending on the scope and results of the assessment. An example of a typical assessment report is shown in DOE-STD-1070-94, Guidelines for Evaluation of Nuclear Facility Training Programs, and DOE-STD-3006-2000, Planning and Conduct of Operational Readiness Reviews, and includes the following sections:

- Cover page
- Summary
- Background
- Description of assessment
- Results and recommendations
- Conclusion

Copies of the draft report should be provided for information to activity management and assessment team members at the exit meeting. Additionally, a copy of each operations assessment report shall be submitted by the assessment team to the senior executive at the Operations Office and the responsible Headquarters offices.

f) Explain the essential elements and processes associated with the following assessment activities:

- **One-on-one interviews;**
- **Entrance and exit meetings;**
- **Corrective action implementation; and**
- **Closure process.**

One-on-One Interviews

During any assessment, the interview process will be an important information-gathering tool. Interviews are an effective method of determining level of knowledge and familiarity with activity policies and procedures. An interview can be the key step in following up on leads. To ensure that all relevant information is obtained efficiently and accurately, each interview should be planned and organized.

Planning is critical to the success of any interview. It enables the assessor to maximize the use of interview time. The planning process does not have to be formal; it may be simply a matter of determining what information is being sought. The assessor should determine

which interviews can be conducted during walkthroughs, special activities, or routine operations at the activity, and which interviews require coordination and scheduling with activity management.

In planning the interview, the assessor should identify the goals for the interview and the items to be discussed so that a logical sequence of questions can be developed beforehand. It may also be appropriate to bring relevant reference documentation for review during interviews. For an interview with the radiological control manager, it may be useful to have survey records and the pertinent radiological control manual readily available.

Two types of questions are routinely used during the interview process: open-ended and closed-ended. A good mix of these two types of questions should provide the assessor with enough information. An open-ended question places the burden of conversation on the interviewee and gives the assessor time to analyze what the interviewee is saying. It reduces the total number of questions asked. An open-ended question elicits more than a yes or no response and is very useful when starting a line of questioning in a new subject area.

For example, asking an operator to “explain” or “describe” an event is an open-ended question. The advantage of open-ended questions is that they usually provide a large amount of information about the topic of interest to the assessor. The interviewee does most of the talking in responding to them, and the information provided is generally volunteered.

A closed-ended question is a specific question that is often answered with only one or two words. Examples are “what,” “when,” “who,” and “where” questions.

Entrance and Exit Meetings

Entrance meetings are designed to explain the purpose of the assessment, discuss the criteria that will be used during the assessment, schedule interviews, and set up the exit interview. Assessments can gain value from an exit interview. This interview is used primarily to present the assessment summary and provide the assessed organization an opportunity to verify the factual accuracy of assessment results. To facilitate this, assessors should be prepared to provide detailed supporting information for those results (ideally, a draft assessment report should be available at this time). This interview also offers an opportunity for the assessed organization to present its management position and any plans for addressing the results. Reasonable time should be allowed to discuss any concerns, but this interview should not be used to argue the assessment agenda or methodology.

Corrective Action Implementation

Management responsible for the activities assessed is also responsible for the development of effective corrective action of the problem areas or deficiencies discovered during the assessment. At a minimum, the corrective action should address

- measures to correct each deficiency
- identification of all root causes for significant deficiencies
- determination of the existence of similar deficiencies
- corrective actions to preclude recurrence of like or similar deficiencies
- assignment of corrective action responsibility
- completion dates for each corrective action

For independent assessments, the proposed corrective action should be reviewed for concurrence by the assessment team leader. This will help ensure that the planned actions will be effective in resolving the problem areas and deficiencies reported by the assessment team.

Closure Process

In the closure process, contractors send a letter to the directives management group (DMG) requesting closure and stating that the corrective actions in the implementation plan have been completed. The DMG coordinates approval of the closure with the appropriate division of primary interest and the contracting officer's representative.

g) Describe the actions to be taken if the contractor challenges the assessment findings and explain how such challenges can be avoided.

Disputes over the assessment findings, the corrective action plan, or its implementation (such as timeliness or adequacy) must be resolved at the lowest possible organizational level. The organization that disagrees with the disposition of a given issue may elevate the dispute for timely resolution. The organization that disagrees with the disposition of a given issue must elevate the dispute in a step-wise manner through the management hierarchy. The dispute must be raised via a deliberate and timely dispute resolution process that provides each party with equal opportunity for input and a subsequent opportunity to appeal decisions up to the Secretary of Energy, if necessary.

h) Participate on assigned contractor training and qualification assessments, including on-site evaluations, such as ORRs and RAs, and document reviews, preparing a report of the results of the assessment.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

16. Technical training personnel shall demonstrate a working-level knowledge of contracts and procurement processes and procedures, and how they apply to procurement of training-related services or products.

a) Describe the process and requirements for paying for individual training courses as detailed in DOE O 360.1B, Federal Employee Training, and DOE M 360.1-1B, Federal Employee Training Manual.

Elements must include training funding in budget submissions, prioritize training needs, and allocate resources accordingly in training plans.

Each DOE element, in allocating resources to support training programs, must give due consideration to DOE and element strategic objectives; training required by law, regulation, DOE directive, or a technical qualification or work performance competency standard; and individual training needs as determined through element needs analyses and functional, occupational, and individual needs assessments and individual development plans.

Training costs can be paid from program funds where the training supports DOE mission and program objectives and the training is an administratively practical method of meeting the necessary program expense of ensuring performance of assigned DOE duties.

Travel funds may be used to pay conference fees where the conference qualifies as a training activity and official travel is approved to attend the conference.

Funds, up to the cost of training programs or services provided to non-DOE participants (or equivalent training services), must be received and credited to the DOE or other appropriation supporting such training activities in accordance with law and standard Federal Government and DOE accounting policies and procedures. Examples of this are

- unique training provided to private sector corporations or individuals under the Work-for-Others program;
- professional, administrative, and technical training that is available to federal employees and is provided to state and local government officials and employees;
- training provided to or developed and delivered under interagency agreements or cooperative arrangements with other federal agencies.

DOE contractors, citizens, and other persons on an individual basis can only participate in training paid for with DOE Federal employee training funds (a) on a space-available basis, (b) if it will benefit DOE, and (c) when either direct statutory or contract authority exists to provide such training or participation at no material cost to DOE.

Training costs, contributions, awards, or services paid for by Internal Revenue Service designated 501(c)(3) nonprofit organizations may be accepted by employees after receiving approval in accordance with element policies and/or procedures.

b) Explain how procurement requests are generated and approved for training services.

The process for generating procurement requests traditionally has been decentralized, with the site office deferring to its own methods and guidance documents. Refer to your site's procurement professionals for assistance in the procurement process.

c) State and discuss the requirements and limitations associated with open competition for services and products.

The competitive procedures available for use in fulfilling the requirement for full and open competition are as follows:

- Contracting officers shall solicit sealed bids if
 - time permits the solicitation, submission, and evaluation of sealed bids;
 - the award will be made on the basis of price and other price-related factors;
 - it is not necessary to conduct discussions with the submitters about their bids;
 - there is a reasonable expectation of receiving more than one sealed bid.
- If sealed bids are not appropriate, contracting officers shall request competitive proposals or use
 - a combination of competitive procedures (e.g., two-step sealed bidding);
 - other competitive procedures (e.g., the selection of sources for architect-engineer contracts in accordance with the provisions of 40 U.S.C. 1102 et seq. is a competitive procedure [see subpart 36.6 for procedures]).

- Competitive selection of basic and applied research and that part of development not related to the development of a specific system or hardware procurement is a competitive procedure if award results from
 - a broad agency announcement that is general in nature, identifying areas of research interest, including criteria for selecting proposals, and soliciting the participation of all submitters capable of satisfying the Government's needs;
 - a peer or scientific review.
- Use of multiple award schedules issued under the procedures established by the Administrator of General Services consistent with the requirement of 41 U.S.C. 259(b)(3)(A) for the multiple award schedule program of the General Services Administration is a competitive procedure.

d) Describe how the type of contract, such as performance-based contracts and fee-based contracts, affects the assessment and evaluation of a contract.

Performance-Based Contracts

Performance-based service contracting emphasizes that all aspects of an acquisition be structured around the purpose of the work to be performed as opposed to the manner in which the work is to be performed. The contractors are given the freedom to determine how to meet the government's performance objectives and achieve the appropriate performance quality levels. Payment is made only for services that meet these levels.

Performance-based contracting means structuring all aspects of an acquisition around the purpose of the work to be performed with the contract requirements set forth in clear, specific, and objective terms with measurable outcomes as opposed to either the manner by which the work is to be performed or broad and imprecise statements of work.

There are five elements of performance-based contracting:

- Statements of work
- Quality assurance
- Selection procedures
- Contract type
- Follow-on and repetitive requirements

At a high level, these are the activities that need to be developed, planned, and executed successfully within a given project and its procurements. From a project perspective, these elements are part of the plans and decision processes required as part of various project activities.

The following seven-step process is adapted from existing government information on performance-based contracting. It is important to note that integrated project teams need to be well-trained in performance-based contracting approaches and updated in lessons learned experiences that may be incorporated, in real time, into any project undertaking.

- Step 1. Establish an integrated project team. This is sometimes referred to as an integrated solutions team, since their fundamental purpose is to find performance-based solutions to agency mission and program needs.
- Step 2. Describe and develop the problem that needs to be solved and the link to the Department's strategic plan and objectives. A clear vision of the need and the requirements leads to the definition of what performance will be necessary to meet

- the requirements. A performance-based picture of the acquisition is to be the team's first goal. However, it is not yet time to retrieve the requirements from former solicitations, search for templates, think about the contract type or incentives, or decide on the contractor or the solution. This effort results in identifying a need and functional requirements and includes early preliminary planning documents such as the initial acquisition strategy, risk comparisons, and potential alternatives.
- Step 3. Examine the potential solutions from both private and public sectors. This is called market research, and it is a vital means of arming the team with the expertise needed to conduct an effective performance-based acquisition. The entire integrated project team needs to have a common understanding of what features (high-level objectives, functions, and constraints), schedules, terms, and conditions are crucial to the potential solution. Picking a specific solution is to be resisted and adequate planning time allowed to carry out the next two steps. This may include the entire project definition phase (selecting, preparing, and delivering the concept), or may be done during any phase as necessary to support a procurement. An example would be preparing for a conceptual design contract, technology development, or a site characterization effort.
 - Step 4. Develop performance work statements for the work to be accomplished. This work statement is included in solicitations or in the work authorizations used to task existing contractors. Let the contractor propose solving the problem, including the labor mix. This statement will satisfy the next step as well as the requirements of Office of Management and Budget, OMB A-11. Below this level, performance work statements and/or statement of objective documents are used as part of the request for proposals. The statement of objective is a very short document that provides the basic, high-level objectives of the acquisition. In this approach, the contractors' proposals contain statements of work and performance metrics and measures. Use of a statement of objectives opens the acquisition up to a wider range of potential solutions. For a large, complex project, this may take multiple contracts, but for a noncomplex project, it may be developed into one bid by a prime contractor and eventually performed by a single contractor.
 - Step 5. Decide how to measure and manage performance. Measuring and managing performance is a complex process and requires the consideration of many factors. These factors include performance standards and measurement techniques, performance management approach, incentives, and more. Best practices in this area include relying on commercial quality standards, having the contractor propose the metrics and the quality assurance plan, considering the use of incentive tools, and selecting only a few meaningful measures on which to judge success. Progress is performance for which the contractor is responsible. Communicating progress for projects is one element of the earned value management system.
 - Step 6. Select the right contractor(s). Bringing the acquisition strategy to fruition by executing the strategy and selecting the right contractor is especially important in performance-based contracting. The contractor must understand the functional and performance requirements and have the capability to fulfill them. The contractor must have technical skills, business and technical management capability, and the ability to integrate activities in complex endeavors. Finally, the contractor must have the support processes (safety, engineering, quality, procurement, etc.) and resources in place to support the Department's objectives and requirements.

- Step 7. Manage performance. During the project execution and transition/closeout phases, management systems are used to monitor, manage, and report performance. This includes appropriate reviews, performance measures, and reporting. Performance is not merely doing the work correctly; it is also doing the work using the proper procedures. While the Department may not direct how something is to be accomplished/achieved, there are statutes, standards, and regulations regarding work processes and the government's role in monitoring the performance of those processes.

Fee-Based Contracts

Fixed-price types of contracts provide goods/services for a firm price or, in appropriate cases, an adjustable price. Fixed-price contracts providing for an adjustable price may include a ceiling price, a target price (including target cost), or both. Unless otherwise specified in the contract, the ceiling price or target price is subject to adjustment only by operation of contract clauses providing for equitable adjustment or other revision of the contract price under stated circumstances. The contracting officer should use firm-fixed-price or fixed-price with economic price adjustment contracts when acquiring commercial items.

A firm-fixed-price contract provides goods/services for a price that is not subject to any adjustment on the basis of the contractor's cost experience in performing the contract. This contract type places upon the contractor maximum risk and full responsibility for all costs and resulting profit or loss. It provides maximum incentive for the contractor to control costs and perform effectively and imposes a minimum administrative burden upon the contracting parties. The contracting officer may use a firm-fixed-price contract in conjunction with an award-fee incentive and performance or delivery incentives when the award fee or incentive is based solely on factors other than cost. The contract type remains firm-fixed-price when used with these incentives.

A firm-fixed-price contract is suitable for acquiring commercial items or for acquiring other supplies or services on the basis of reasonably definite functional or detailed specifications when the contracting officer can establish fair and reasonable prices at the outset, such as when

- there is adequate price competition;
- there are reasonable price comparisons with prior purchases of the same or similar supplies or services made on a competitive basis or supported by valid cost or pricing data;
- available cost or pricing information permits realistic estimates of the probable costs of performance;
- performance uncertainties can be identified and reasonable estimates of their cost impact can be made, and the contractor is willing to accept a firm fixed price representing assumption of the risks involved.

e) Describe the process for developing a scope of work, request for proposal, and evaluation criteria to determine the best source or provider of training services or products.

Scope of Work

The scope or statement of work defines the services DOE is procuring. The statement of work is the Department's key direction to the contractor, and its specificity is critical to reducing costs while increasing the timeliness and quality of the training experience.

A statement of work forms the basis of the contracting officer's decisions on contract or task type (generally, fixed-price versus cost-reimbursement) and incentives to encourage attainment of desired outcomes and reward superior performance.

A statement of work should emphasize what the contractor is to accomplish rather than how the work is to be done.

A highly performance-specific statement of work permits prospective training contractors to price their offers more accurately and allows price competition to be effective. Vague statements of work will elicit vague proposals, with budgetary allowances to protect the submitter from underestimating the complexity or scope of the job. It then becomes harder for the source selection team to compare proposals on the basis of technical adequacy or value for cost. The greater the specificity, the better the potential fit to a fixed-price contract. Low specificity generally requires a cost-reimbursement type contract.

A statement of work may specify performance elements (for example, document quality, cost, and timeliness) that DOE wishes to link to incentives.

A clear, results-oriented statement of work facilitates DOE evaluation of contractor performance when the contract work is completed.

Request for Proposal

A request for proposal (referred to as an RFP) is an invitation for suppliers, through a tender process, to bid on a specific product or service. An RFP is usually part of a complex sales process, also known as enterprise sales.

An RFP typically involves more than the price. Other requested information may include basic corporate information and history, financial information (can the company deliver without risk of bankruptcy), technical capability (used on major procurements of services, where the item has not previously been made or where the requirement could be met by varying technical means), product information such as stock availability and estimated completion period, and customer references that can be checked to determine a company's suitability.

RFPs often include specifications of the item, project, or service for which a proposal is requested. The more detailed the specifications, the better the chances that the proposal provided will be accurate. Generally, RFPs are sent to an approved supplier or vendor list.

The bidders return a proposal by a set date and time. Late proposals may or may not be considered, depending on the terms of the initial RFP. The proposals are used to evaluate the suitability as a supplier, vendor, or institutional partner. Discussions may be held on the proposals (often to clarify technical capabilities or to note errors in a proposal). In some instances, all or only selected bidders may be invited to participate in subsequent bids, or may be asked to submit their best technical and financial proposal, commonly referred to as a Best and Final Offer (BAFO).

Evaluation Criteria

Contracting officers evaluate proposals on the factors specified in the solicitation. These may include the work plan, proposed contract personnel, the submitter's experience, price

quotations, quality, and other criteria. Selection may involve evaluation of proposals by a review panel and ranking of submitters according to set criteria.

The contracting officer will determine which proposals are competitive enough to remain under consideration during negotiation. Submitters whose proposals are judged to be outside the competitive range are notified in writing that their proposals are no longer being considered.

f) Describe the requirements and process for using existing government sources for training services and products, including

- **Management and operating contractors**
- **Support services contractors**
- **Other government agencies**
- **Local schools and universities**

Funds, up to the cost of training programs or services provided to non-DOE participants (or equivalent training services), must be received and credited to the DOE or other appropriation supporting such training activities in accordance with law and standard Federal Government and DOE accounting policies and procedures. Examples of this are

- unique training provided to private sector corporations or individuals under the Work-for-Others program;
- professional, administrative, and technical training that is available to federal employees and is provided to state and local government officials and employees;
- training provided to or developed and delivered under interagency agreements or cooperative arrangements with other federal agencies.

DOE contractors, citizens, and other persons on an individual basis can only participate in training paid for with DOE federal employee training funds (1) on a space-available basis, (2) if it will benefit DOE, and (3) when either direct statutory or contract authority exists to provide such training or participation at no material cost to DOE.

g) Describe the roles and responsibilities of the contracting officer representative (COR) and explain the relationship between the contracting officer representative, the contracting officer, and the contractor.

While it is ideal for the COR to be named as soon as a requirement is initiated so that the COR can be involved in the solicitation as well as the administration of the contract after the award, it is recognized that this is not always possible. The functions listed below are performed by someone in the requirements office, whether it is the COR or not. For administrative convenience, all functions listed will be referred to as COR functions.

The COR is responsible for

- defining project requirements and developing a statement of work (SOW) or specifications;
- initiating, developing, and transmitting a complete procurement request package (PRP) to the contracting office, with all required administrative approvals;
- obtaining certification of the availability of sufficient funds from the proper appropriation and compiling any other required financial data;
- obtaining appropriate justification for other than full and open competitive acquisitions, if necessary;

- if serving as Chairperson of the Technical Evaluation Panel, participating in and directing the evaluation of the technical proposals for negotiated procurement and providing recommendations to the contracting officer;
- assisting the contracting officer during discussions/negotiations;
- monitoring the contractor's technical progress and the expenditures of resources relating to the contract;
- performing inspection and accepting the work on behalf of the U.S. Government;
- informing the contracting officer, in writing, of any performance or schedule failure by the contractor;
- resolving technical issues arising under the contract which fall within the scope of the COR's authority, and referring to the contracting officer any issues which cannot be resolved without additional cost or time;
- informing the contracting officer, in writing, of any needed changes in the statement of work;
- ensuring that the U.S. Government meets its contractual obligations to the contractor, e.g., providing Government-furnished equipment and services and timely Government review and approval of documents if such reviews are required by the contract;
- reporting costs being incurred which are not appropriately chargeable to the contract (cost-type contracts only);
- maintaining a COR file;
- verifying contractor statements regarding the development of patentable inventions, if required under the contract;
- assisting in contract closeout by informing the contracting officer when the work has been completed and by forwarding contract administration records to the contracting officer.

h) Conduct a cost-benefit review and analysis for the selection of one of two given vendor courses, and report the results.

This is a performance-based competency. The qualifying official will evaluate the completion of this competency.

17. Technical training personnel shall demonstrate a familiarity-level of knowledge of project management practices sufficient to manage training-related programs and projects.

a) Explain the purpose of project management and describe the life cycle of a typical project.

Project management is the application of knowledge, skills, and abilities to a variety of activities to successfully complete a project. In general, a project is a unique effort that supports a program mission, has defined start and end points, is undertaken to create a product, a facility, or a system, and contains interdependent activities planned to meet a common objective or an overall mission.

Phases in a typical project are identified through critical decisions (CD). A CD is a formal determination or decision at a specific point in a project phase that allows the project to proceed to the next phase and resources to be committed. CDs are required during the planning and execution of a project; for example, prior to commencement of conceptual

design, commencement of construction, or start of operations. CDs for traditional construction projects include the following:

- CD-0, Approve mission need
- CD-1, Approve preliminary baseline range
- CD-2, Approve performance baseline
- CD-3, Approve start of construction
- CD-4, Approve start of operations or project closeout

b) Describe the applicable federal rules and regulations, along with the typical documents and data sources used in project management.

Typical documents used in project management include the project execution plan and a mission need document.

The project execution plan is the primary agreement on project planning and objectives between the Headquarters (HQ) program office and the field that establishes roles and responsibilities and defines how the project will be executed. The project execution plan, once approved, becomes a significant tool for the project manager through the life of the project. The HQ or field program manager and/or the federal project manager initiate a project execution plan.

Development of the preliminary project execution plan can be started by the prime contractor at the same time as development of the acquisition plan, or shortly thereafter. The two plans should be synchronized. If the approved acquisition plan indicates that the contractor has a role in the acquisition of the project as prime contractor/integrator, the contractor may participate with DOE in development of the final project execution plan.

A mission need statement documents a mission requirement that the Department cannot meet through nonmaterial means. It is the primary document supporting Critical Decision-0, Approve Mission Need. Mission needs are identified in terms of capability, and not in terms of equipment, facility, or other solutions. Mission needs must support DOE's strategic plan and lower level plans for each program. Approval of the mission need is the authorization to develop alternative concepts and functional requirements. A mission need statement is developed for projects having a total project cost greater than \$5 million, and is reviewed by the Office of Management, Budget, and Evaluation.

c) Identify and explain the major elements of a project, and discuss their relationship.

The acquisition management system establishes a management process to translate user needs and technological opportunities into reliable and sustainable facilities, systems, and assets that provide the required mission capability. The system is organized by phases and critical decisions. The Deputy Secretary serves as the Secretarial Acquisition Executive (SAE) for the Department. As the SAE, he/she promulgates Department-wide policy and direction, and personally makes critical decisions for major system projects. Designated acquisition executives make critical decisions for non-major system projects. The phases represent a logical maturing of broadly stated mission needs into well-defined technical, system, safety, and quality requirements, and ultimately into operationally effective, suitable, and affordable facilities, systems, and other end products.

Initiation Phase

During the initiation phase, identified user needs are analyzed for consistency with the Department's strategic plan, congressional direction, administration initiatives, and political and legal issues. One outcome of the analysis could be a determination that a user need exists that cannot be met through other than material means. This outcome leads to the development and approval of a mission need statement that discusses the user need in terms of required capability, and not equipment, facilities, or other specific products. This is the first critical decision of the acquisition process: to approve mission need. The information developed during this phase also provides the basis for the project engineering and design budget request when preliminary design activities are planned.

Definition Phase

Upon approval of mission need, the project enters the definition phase, where alternative concepts based on user requirements, risks, costs, and other constraints are analyzed to arrive at a recommended alternative. This is accomplished using systems engineering and other techniques and tools, such as alternatives analysis and value management, to ensure the recommended alternative provides the essential functions and capability at the optimum life-cycle cost, consistent with required performance, scope, schedule, and cost. During this phase, more detailed planning is accomplished which further defines the required capability. These efforts include conceptual design, requirements definition, risk analysis and management planning, and development of the acquisition strategy. The products produced by this planning provide the detail necessary to develop a rough order of magnitude or range for the project cost and schedule. The recommended alternative, when sufficiently defined and analyzed, is presented to the SAE or designated acquisition executive for review and approval (Critical Decision 1 — Approve Alternative Selection and Cost Range).

Execution Phase

Upon completing the definition phase, the project enters the execution phase where the focus is on further defining the selected alternative, developing preliminary designs, arriving at a high-confidence baseline, and generating the complete project execution plan, all of which support a request for funds in the DOE budget. This part of the execution phase culminates with the development of the performance baseline, which is presented to the SAE or designated acquisition executive for approval (Critical Decision 2 — Approve Performance Baseline). The performance baseline documents the Department's commitment to Congress to execute the project at a specific cost and schedule threshold and achieve a specific performance capability. After critical decision 2, engineering and design continue until the project is ready for construction or implementation. Before major budget and other resources for construction or implementation are committed, an executability review is performed as a precursor to Critical Decision 3 — Approve Start of Construction.

Transition/Closeout Phase

The transition/closeout phase is when the project is approaching completion and has progressed into formal transition, which generally includes final testing, inspection, and documentation, as the project is prepared for operation, long-term care, or closeout. Once implementation is substantially complete, transition to operations begins. The transition point will depend on the type of project. A project may seek approval to transition to operations (Critical Decision 4 — Approve Start of Operations or Project Closeout) when

required capability is implemented and functioning, and operational resources are in place, have been trained, and are able to perform their continuing responsibilities.

To execute its missions, the Department organizes related and interdependent mission elements into programs. Programs may be composed of ongoing operational activities with no set duration periods, acquisition activities with specific durations, or combined acquisition and operational programs. An operational activity is typically identified by multi-year activities that use relatively straight-line funding over an extended period of time and work planning that is normally accomplished for each year. Acquisition projects are structured to deliver defined capabilities within fixed time frames and costs, and tend to have funding plans that peak in the middle of the project with a corresponding slope as the project progresses to completion. Planning for acquisition projects normally is multi-year from start to completion.

A program is an organized set of activities directed toward a common purpose, objective, or goal undertaken or proposed by an agency to carry out assigned responsibilities. The term is generic and may be applied to many types of activities. Acquisition programs are programs whose purpose is to deliver a capability in response to a specific mission need. Acquisition programs may comprise multiple acquisition projects and other activities necessary to meet the mission need.

Projects are specific undertakings that support a program mission, are undertaken to create a product, facility, or system, and have defined beginning and end points. DOE projects range from relatively simple vertical construction of a building to developing, designing, and implementing large, complex, one-of-a-kind systems made up of multiple subsystems that require the integration of multiple locations and systems into a unified whole. Projects also include developing and installing software systems, remediation and disposition of contaminated sites and facilities, and restoration or modernization of existing facilities and infrastructure. Most projects are characterized as a collected set of overlapping, interdependent activities. For example, design may be ongoing in one project area, while in another project area, items may be in construction or testing.

d) Explain the purpose and use of a project management plan.

The project management plan, also called the project execution plan, is the primary agreement on project planning and objectives between the HQ program office and the field that establishes roles and responsibilities and defines how the project will be executed. The project execution plan, once approved, becomes a significant tool for the project manager through the life of the project. The HQ or field program manager and/or the federal project manager initiate a project execution plan.

Development of the preliminary project execution plan can be started by the prime contractor at the same time as development of the acquisition plan, or shortly thereafter. The two plans should be synchronized. If the approved acquisition plan indicates that the contractor has a role in the acquisition of the project as prime contractor/integrator, the contractor may participate with DOE in development of the final project execution plan.

e) Discuss the relationship between a work breakdown structure (WBS) and the cost and schedule.

Cost estimates are prepared using appropriate estimating methodologies that are integrated with the WBS and the DOE cost structure as specified by DOE for all contract work. All estimates are in accordance with Federal Acquisition Requirements (FAR) 15.804, Cost and Price Data Analysis, as appropriate.

Planning and scheduling is a process that is established and is in operation through the life of the project to identify programmatic, operational, legislative, institutional, and other requirements or constraints that may affect technical, cost, or schedule baselines, and to ensure that such baselines reflect such potential impacts.

Schedules are developed integrating the WBS and cost estimate, and represent all work scope regardless of funding source. Activity logic is used to depict all work scope, constraints, and decision points. Estimates and durations are assigned to activities that represent work accomplishments. The detailed scheduled activities form the master and intermediate level schedules as required.

f) Describe the purpose of schedules, and discuss the use of milestones and activities.

Critical milestones, in chronological order, provide the key tasks and target dates representing broad events required to correct a problem and its root cause(s).

All critical milestones must list an original target completion date by month and year. This is the date included in the original action plan as the proposed completion of the milestone, and it must stay the same through closure. A revised target or actual completion date denoted by month and year must be listed if

- the milestone target completion date has been revised, in which case the most current date must be listed;
- the milestone has been completed, in which case the completion month and year must be listed.

Critical milestones completed during the current year should correspond with planned actions indicated on the prior year's plan.

g) Describe the critical path method of scheduling.

The critical path method (CPM) is a project management technique that identifies activities that have the least amount of scheduling flexibility (i.e., are the most mission-critical) and then predicts project duration schedule based on the activities that fall along the critical path. Activities that lie along the critical path cannot be delayed without delaying the finish time for the entire project. Projects planned with CPM typically are graphically represented on a diagram showing how each activity is related to the others.

CPM can be employed in the development of hardware or software, and there are CPM applications available for computerized project management.

Acronyms

ANS	American Nuclear Society
ANSI	American National Standards Institute
ASTD	American Society for Training and Development
BAFO	best and final offer
CBT	computer-based training
CD	critical decisions
COR	contracting officer representative
CPM	critical path method
DIF	difficulty, importance, and frequency
DMG	directives management group
DOE	Department of Energy
EM	environmental management
ETS	Enterprise Training Services
FAR	federal acquisition requirements
FMEA	failure modes and effects analysis
FRAM	Functions, Responsibilities, and Authorities Manual
FTCP	Federal Technical Capability Program
GET	general employee training
HAZOP	hazard and operability
HAZWOPER	hazardous waste operations and emergency response
HQ	Headquarters
HR	Human Resource Management
IDPs	individual development plans
ISD	instructional systems development
ISM	integrated safety management
ISMS	Integrated Safety Management System
KSAs	knowledge, skills, and abilities
M&O	management and operating
MA-1	management and administration
MANTG	Mid-Atlantic Nuclear Training Group
MEO	most efficient organization
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
ORPS	occurrence reporting and processing system
ORRs	operational readiness reviews
OSHA	Occupational Safety and Health Administration
PAAA	Price Anderson Amendment Act
PBT	performance-based training
PPE	personal protective equipment
PRP	procurement request package
PWS	performance work statement
QA	quality assurance
QAP	QA program

Acronyms

RAAs	readiness assessments
RFP	Request for Proposal
RO	residual organization
S/CIs	suspect/counterfeit items
SAE	Secretarial Acquisition Executive
SAR	Safety analysis report
SAT	systematic approach to training
SMEs	subject matter experts
SMS	Safety management system
SOW	statement of work
SPMS	Safety performance measurement system
TAP	Training Accreditation Program
TES	Training/Evaluation Standard
TESs	Training/Evaluation Standards
TLOs	terminal learning objectives
TQP	Technical Qualification Program
TSD	training system development
TSRs	technical safety requirements
TTM	task-to-training matrix
WBS	work breakdown structure

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