# U.S. Department of Energy Orders Self-Study Program

# DOE-HDBK-1203-97

GUIDE TO GOOD PRACTICES FOR TRAINING OF TECHNICAL
STAFF AND MANAGERS

# DOE-HDBK-1204-97

GUIDE TO GOOD PRACTICES FOR THE DEVELOPMENT OF
TEST ITEMS

# DOE-HDBK-1205-97

GUIDE TO GOOD PRACTICES FOR THE DESIGN,
DEVELOPMENT, AND IMPLEMENTATION OF EXAMINATIONS

# DOE-HDBK-1206-98

GUIDE TO GOOD PRACTICES FOR ON-THE-JOB TRAINING



National Nuclear Security Administration

**DOE-HDBK-1203-97, GUIDE TO GOOD PRACTICES FOR TRAINING OF TECHNICAL STAFF AND MANAGERS; DOE-HDBK-1204-97, GUIDE TO GOOD PRACTICES FOR THE DEVELOPMENT OF TEST ITEMS; DOE-HDBK-1205-97, GUIDE TO GOOD PRACTICES FOR THE DESIGN, DEVELOPMENT, AND IMPLEMENTATION OF EXAMINATIONS; AND DOE-HDBK-1206-98, GUIDE TO GOOD PRACTICES FOR ON-THE-JOB TRAINING
FAMILIAR LEVEL**

## OBJECTIVES

Given the familiar level of this module and the resources listed below, you will be able to answer the following questions:

1. What is the goal of initial training?
2. When should new technical staff personnel be assigned to the department where they were hired to work?
3. What is the goal of continuing training?
4. What is the definition of exception?
5. When is an exception from training granted?
6. When are challenge examinations allowed to be administered?
7. What are test specifications?
8. What are learning objectives?
9. What are three things an instructor should ensure for proper test administration?
10. What are the four common methods of scoring tests?
11. What are four of the ten basic principles that apply across all test item formats?
12. What are the three factors a test developer should consider when developing tests?
13. What is the definition of backwards logic?
14. What are four of the considerations for determining point value of test items?
15. What is the purpose of the on-the-job training (OJT) program?
16. What are three disadvantages of the OJT program?
17. How are training requirements identified?
18. What is the purpose of an OJT checklist/qualification card?
19. What is the purpose of a qualification standard?
20. What is the purpose of an OJT guide?

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**Note: If you think that you can complete the practice at the end of this level without working through the instructional material and/or the examples, complete the practice now. The course manager will check your work. You will need to complete the practice in this level successfully before taking the criterion test.**

**RESOURCES**

DOE-HDBK-1203-97, *Guide to Good Practices for Training of Technical Staff and Managers,* January 1997.

DOE-HDBK-1204-97, *Guide to Good Practices for the Development of Test Items*, January 1997.

DOE-HDBK-1205-97, *Guide to Good Practices for the Design, Development, and Implementation of Examinations*, June 1997.

DOE-HDBK-1206-98, *Guide to Good Practices for On-the-Job Training*, April 1998

**Note: The following references, annotated in DOE-HDBK-1203-97, DOE-HDBK-1204-97, DOE-HDBK-1205-97, and DOE-HDBK-1206-98, may be required to answer questions in the practice and criterion test for this module.**

DOE-HDBK-1074-95, *DOE Handbook: Alternative Systematic Approaches to Training*, January 1995.

DOE-HDBK-1078-94, *DOE Handbook: A Systematic Approach to Training*, August 1994.

DOE-HDBK-1200-97, *DOE Handbook: Guide to Good Practices for the Development of Learning Objectives*, January 1997.

## INTRODUCTION

The familiar level of this module is divided into four sections. In the first section, the module will present DOE-HDBK-1203-97, *Training Program for Technical Staff Personnel*, which covers the different types of training available to technical staff personnel; section two, DOE-HDBK-1205-97, *Guide to Good Practices for the Design, Development, and Implementation of Examinations*, provides direction to training personnel in the broad areas of design, development, and implementation of examinations; section three, DOE-HDBK-1204-97, *Guide to Good Practices for the Development of Test Items*, presents the two components of test items: the content and the format; and section four, DOE-HDBK-1206-98, *Guide to Good Practices for On-the-Job Training*, is designed to prepare employees for on-the-job (OJT) program development. Practices and several examples are provided throughout the module to help familiarize you with the material. The practice will help prepare you for the criterion test.

Before continuing, you should obtain copies of DOE-HDBK-1203-97, 1204-97, 1205-97, and 1206-98. Copies of these documents are available on the Office of Health, Safety and Security web site at https://www.hss.doe.gov/nuclearsafety/NS/techstds or through the course manager. You may need to refer to these documents to complete the examples, practice, and criterion test.

## SECTION 1, DOE-HDBK-1203-97, TRAINING PROGRAM FOR TECHNICAL STAFF PERSONNEL

### Initial Training

The goal of initial training is to supplement position-specific education, experience, and training in order to familiarize technical staff and managers with facility-specific information. This enhances their ability to perform assigned duties in a manner that promotes safe and reliable nuclear facility operations. New technical staff personnel and managers should be provided guidance and training designed to familiarize them with nuclear facility activities. The initial training period should enable the trainee to become familiar with the following:
- Facility and corporate organization
- Nuclear cycle overview, including a description of the mission of other DOE fuel and weapons facilities
- Facility fundamentals (as applicable)
  - heat transfer, fluid flow, and thermodynamics
  - electrical science
  - nuclear physics
  - chemistry/chemistry controls
  - process controls
  - material science
- Facility systems and compromise
- Facility operations
- Facility simulator training (as appropriate)
- DOE Orders and directives
- Codes and standards overview

- Quality assurance and quality control practices
- Facility document system
- Facility policies and practices regarding planning and scheduling activities
- Material, maintenance, and modification control
- As-low-as-reasonably-achievable (ALARA) practices
- Radioactive waste reduction program
- Nuclear criticality control

**Staff Assistance Training**

Following completion of the first module, initial training, and prior to entering the facility-specific training program, technical staff personnel new to nuclear facilities should be assigned to the department they were hired to work in. This period generally should be devoted to OJT with emphasis on familiarizing the individual with job responsibilities. Guidelines should be provided to ensure that key elements of the job are addressed during this training phase.

It is recommended that the individual be temporarily assigned to work with other departments to develop some knowledge of overall facility operation and interdepartmental relationships. Productive work assignments should be tasks for which the individual is qualified.

**Continuing Training**

The goal of the continuing training program is to ensure that technical staff personnel and managers maintain and improve their skills and are cognizant of nuclear facility physical and procedural modifications, changes to DOE and regulatory requirements, and lessons learned from industry and facility-specific operating experiences that affect their job performance. Review of important but infrequently used knowledge areas and the development of broader scope and depth of job-related skills and knowledge are goals of a continuing training program.

**Exceptions**

Personnel already proficient in subject material may be excepted from training. Exception refers to the release of an individual from portions of a training program on the basis of the individual's experience, education, and training that is related to their particular job. Even though the training program (or a portion thereof) is being excepted, the requisite examinations to establish qualification should still be completed. In all cases, the facility should ensure that sufficient facility-specific training is provided to the individual to enable him/her to perform their job requirements in a safe and efficient manner.

DOE contractors should establish procedures and criteria to administer and document exceptions to initial and continuing training requirements. These procedures should contain specific directions regarding the process to be used to except persons from training program requirements. When considering an individual for exception to training requirements, the employee's prior training, education, and job experience should be reviewed. This review may be by line management or it may be through the use of review groups or committees. Regardless of the method used to arrive at

the decision to except an individual from training, the justification should be fully documented and included as a part of the person's training record.

Individuals, who believe that they have the knowledge or skills equivalent to that addressed by the training, may challenge the requirements to attend individual portions of the training program. In situations such as these, an examination (written or performance) may be administered. If challenge examinations are administered, they should be sufficiently comprehensive to adequately test the learning objective(s) that are stated in the training and, as such, challenge tests are administered somewhat differently than exceptions. Accordingly, they are typically administered locally and do not need to be justified on a case-by-case basis when used in place of attending training for technical staff and managers.

**Note: You do not have to do example 1 on the following page, but it is a good time to check your skill and knowledge of the information covered. You may do example 1 or go to section 2.**

**EXAMPLE 1**

Using the familiar level of this module and the resources, answer the following questions.

1. What is the goal of initial training?

2. What is the goal of continuing training?

3. What is the definition of exception?

4.  When is an exception from training granted?

5.  When should new technical staff personnel be assigned to the department where they
    were hired to work?

**Note: When you are finished, compare your answers to those contained in the example 1
self-check. When you are satisfied with your answers, go to section 2.**

**EXAMPLE 1 SELF-CHECK**

1.  What is goal of initial training?

    The goal of initial training is to supplement position-specific education, experience, and training in order to familiarize technical staff and managers with facility-specific information.

2.  What is the goal of continuing training?

    The goal of the continuing training program is to ensure that technical staff personnel and managers maintain and improve their skills and are cognizant of nuclear facility physical and procedural modifications, changes to DOE and regulatory requirements, and lessons learned from industry and facility-specific operating experience that affect their job performance.

3.  What is the definition of exception?

    Exception refers to the release of an individual from portions of a training program on the basis of the individual's experience, education, and training that is related to their particular job.

4.  When is an exception from training granted?

    Personnel who already are proficient in subject material may be excepted from training on the basis of the individual's experience, education, and training that is related to the particular training.

5.  When should new technical staff personnel be assigned to the department where they were hired to work?

    Following completion of the first module, initial training, and prior to entering the facility-specific training program, technical staff personnel new to nuclear facilities should be assigned to the department for which they were hired.

## SECTION 2, DOE-HDBK-1205-97, GUIDE TO GOOD PRACTICES FOR THE DESIGN, DEVELOPMENT, AND IMPLEMENTATION OF EXAMINATIONS

### Written and Oral Tests

When written and oral tests are designed and developed, several decisions should be made early in the process. These decisions include:
- Specific learning objectives to be tested
- Format for the test
- Amount of emphasis each test item receives
- Number of items on the test
- Time allowed for the test
- Statistical properties of test items such as difficulty and discrimination, where appropriate

### Open Reference Test

Open reference or open book testing is when the reference, or a sufficient subset of the reference, is provided to the trainee during administration of a test. The test developer should determine the necessary references and their applications after reviewing the learning objectives and the test specifications. While the open reference test is essentially no different than other written tests, except that trainees need to know what will be expected during testing. Listing specific references may not be necessary; however, the references and job aids should be made available during testing consistent with the conditions stated in the learning objectives.

Administer all closed reference test items separately and prior to the open-reference test section. This ensures that the trainees do not find so-called giveaway answers in the references. Allow sufficient time for the trainees to complete the open reference questions. The more familiar trainees are with the references, the faster they can complete the items. Be careful that the test does not become a time test. Unless time is a crucial factor in the task, it should not be made a part of the test.

### Test Specifications

Test specifications are a blueprint, or plan, that clearly defines the scope and content of the test. It is the documentation for the decisions made in the initial planning stages. Just as it is important to develop learning objectives before instruction is planned, it is necessary to develop test specifications prior to test construction.

The development of test specifications is a vital step in the testing process. Test specifications provide two important checks on the entire test mechanism. They are:
- An explicit, documented link between each test item and a learning objective that is verified to be relevant, important, and based on the task
- Consistency in the way tests are developed at a facility

Consistency will assist in reducing biases in test content due to the instructor's likes and dislikes or the changing of personnel at the facility. The process ensures all decisions for job placement are based on trainee performance on the same body of knowledge and ability, even though specific topics covered on individual tests may differ.

**Developing Test Specifications**

Since learning objectives complete with action statements, conditions, and standards already exist, the major portion of test planning is accomplished. What remains is to determine the test items that will be covered in the test, how many items will be included, and the test items that are relatively important. When developing test specifications for exams, it is important to recognize that the knowledge and skills for all learning objectives must be tested at some point in the training.

Table 1 shows test specifications developed from a list of learning objectives. The objective statements indicate the type and level of performance expected of the trainee. The instructor should select the objectives that will be tested on a given exam and establish the relative emphasis each learning objective receives.

**Table 1.** Test Specifications

| Objectives for Training | Testing Emphasis (item weight %) | Objectives to be Included in Test |
|---|---|---|
| I.   Area A | | |
|     1. | 5 | Yes |
|     2. | 10 | Yes |
|     3. | 0 | No |
|     4. | 5 | Yes |
| II.   Area B | | |
|     1. | 10 | Yes |
|     2. | 0 | No |
|     3. | 2 | Yes |
|     4. | 0 | No |
| III.   Area C | | |
|     1. | 5 | Yes |
|     2. | 10 | Yes |
|     3. | 2 | Yes |

*Source:* DOE-HDBK-1205-97, June 1997.

As table 1 shows, objective 111.2 is given twice as much weight on the test as 111.1 and five times as much weight as 111.3. These different weights are based on the objectives' comparable importance to success in job performance and should reflect the relative time spent on the objectives during the course of the training program. The objectives that represent task elements that are

critical to the successful accomplishment of the task must be tested and those test items cannot be missed. The test developer should obtain input from other trainers, from SMEs, and from facility operations management and supplement this with his/her own prior experience. Learning objectives can be assigned greater emphasis by increasing the number of test questions for those objectives. Table 1 further shows that objectives 1.3, 11.2, and 11.4 do not appear in this test. This is because they were covered in previous tests, will be covered in later tests, or can be tested in conjunction with other objectives.

## Test Construction

The actual test is constructed following test design and test item development. Test construction requires the test developer to establish the test layout, assemble the test items, prepare the answer key, and write test directions. Test construction must be completed before implementing the training program.

Test developers should construct tests to some predetermined standardized appearance. The layout and source are not as important as maintaining consistency for all of the facility's tests. This consistency of appearance has several advantages. One advantage is minimizing trainee stress by providing a layout trainees are familiar with; test day is an inappropriate time for introduction of a new test format or layout. Another advantage is improved reliability. Inherent reliability is based on the consistency or dependability of test results. Trainees should be tested in a similar manner from test to test. This involves similar test lengths, consistent grading and scoring, use of the same construction guidelines, consistent coverage of topics, familiar test item formats, etc.

Facilities should have procedures in place that establish the format and layout of their training program tests. Tests are assembled using the following general guidelines.
- Select the appropriate test items based on the test specifications.
- Prepare the test key when the test is constructed.
- Indicate and be consistent with point allocations for each answer in regard to the importance of the learning objective that the test item is testing.
- Assign the number of questions per content area that reflects the appropriate emphasis.
- Change the tests' content from one test to the next so they are not compromised.

## Test Layout and Assembly

The test should be assembled in a logical and easily understood format and should follow conventional rules of order for the test items. Written tests should include typed or printed test items (no handwritten tests) and should be reproduced so each trainee has a test. Writing the questions on the board or stating the questions orally invites misunderstanding. An oral examination is not meant to be a written test given orally; rather, it is a unique situation requiring two-way communication.

The test should be clearly labeled. The course, test title, associated unit of study, administration date, and test form should be stated on the test. If the test is to have trainee responses written on it, put this identifying information on a cover page where the trainee's name, employee number, or other required information is entered. The preferred arrangement of test items is to group:

- All items using a common body of supporting information (e.g., diagram, table, or scenario) even if test item formats must be mixed
- All items of the same format
- All items dealing with the same learning objective
- Items from least to most difficult

Some tests consist of only one format, but most tests contain a variety of formats. While using only one format has the advantage of simplicity and clarity in giving only one set of directions, it is more difficult and time consuming for the test developer to force all questions into one format. There is nothing wrong with a variety of formats; however, to keep the test responses ordered from simple to complex, the following order of test items is suggested:

- Multiple choice items
- Matching items
- Short answer items
- Essay questions

When a diagram, drawing, or block of information is used with a test item or items, place it above or below the test question if possible. If it is too large to go on the same page as the test item, it should be attached as the next page in the test so the trainee does not have to search for it. The test item should state the location of the diagram, drawing, etc., if not on the same page. Avoid splitting a test item's material between two pages, but if one is split, present all of the item alternatives on the same page. Keep matching items together on the same page.

Consideration should be given to placing only one question per test page. This minimizes the administrative burden on the trainee, improves test clarity, and reduces the chances of the trainee inadvertently failing to answer a question.

**Written Test Administration**

Test administration has an important effect on the usefulness of test results and requires control. The instructor should ensure that a suitable environment is established, consistent and clear test directions are given, and proper supervision is present for the entire test.

Establish Environment

Effective testing environments require attention to the physical qualities of the test setting and to the trainee's emotional climate. High noise levels, poor lighting, lack of ventilation, excessive heat or cold, and frequent interruptions will lower trainee test performance. The instructor should optimize, to the extent possible, the conditions for testing. This may be as simple as scheduling testing in the morning if the classroom becomes too hot in the afternoon.

While most instructors are aware of the physical testing environment, many do not give sufficient consideration to the emotional environment they establish. The testing environment should be conducive to effecting testing. Making the purpose of the test clear and emphasizing the need for accurate test results can create a good emotional climate that is important in building motivation, reducing anxiety, and improving communications.

Test Directions

Each test should have clearly written directions that tell the trainee what to do, how to do it, and how to record the responses. General directions should be given for the test, with specific directions given for each section, subpart, and item format. Though the instructor should orally present the directions prior to the start of the test, the written directions should be clear enough to enable the trainees to complete the test without any further instructions. The trainee should be given time to read the instructions and ask questions before the test is started.

Questions that require mathematical calculations pose a unique problem. Suppose a trainee performs a complex equation using a calculator in one step, while the answer key breaks down the calculation into individual steps. The resulting answer will be different from the answer provided in the answer key, since the answer key will break the answer down. Each step is then calculated separately and rounded to a significant digit. Rounding of answers can cause an otherwise correct answer to be marked as wrong; therefore, precision or accuracy of answers needs to be addressed in the test directions and in the answer key.

Inform the trainees that they may ask questions during the test. Avoid giving individualized assistance by providing any clarifying information from individually asked questions to the entire group. Trainees should be told the value of test items and how they will be scored. The trainee should know whether partial credit will be given, what degree of precision is required, whether units must be identified (such as psi, ohms, rem), and, for calculations, if work must be shown. Time limits should be stated.

When developing the instructions, keep them clear and concise. Make important points stand out by using a different size type, placing the type in bold, or by underlining. Have an independent review done of the directions to check for inconsistencies or potential misunderstandings. Consider including sample items with the directions when introducing difficult or unusual item formats. Clear directions will help maintain the reliability and validity of the test.

Test Monitoring

Effective test monitoring will ensure that everyone has the same opportunity to understand and answer the questions properly. It is important that the test results provide an accurate indication of a trainee's performance.

Training procedures should provide definitive guidance for test monitoring. A clear policy on academic honesty should be established at the beginning of any training program and should be enforced throughout the program. The single best method is to observe trainees carefully during testing. Some training department procedures require that each trainee sign an affidavit, usually on the test cover sheet, stating the work is the individual's own. This has some deterrent value; however, it should not be allowed to replace other useful methods. These include spacing trainees during testing, using multiple test forms, and revising the test for each session.

## Oral Test Administration

When oral examinations (as opposed to oral questioning) are used, the test questions should be developed prior to administration. The acceptable answers should be recorded in advance along with the applicable references and basis for the questions. This is called pre-scripting and is done to ensure the examination is relevant and valid and provides for consistent tests. The trainee responses should be recorded for evaluation and documentation. The basic procedures for oral examination development are not significantly different from those applicable to written tests. However, the procedures for administering an oral examination have certain key considerations that should be followed.

The number of persons present during an examination should be limited to ensure test integrity and to minimize distractions to the trainees. If a task is performed as part of the examination, a qualified person should be present. Other trainees should not be allowed to witness an oral examination. Oral examinations are not to be used as training vehicles for future trainees. Other instructors may be present either to witness the oral exam as part of their training, or to audit the performance of the instructor administering the test. Others may be allowed to observe oral examinations if the instructor approves the request to observe the test, and the trainee does not object to the observer's presence. An instructor should brief the trainee, concerning observers, prior to beginning the oral examination.

While administering the oral examination, the instructor should allow and encourage the trainee to draw diagrams, flow paths, or other visual representations as appropriate. This allows the trainee to better express himself/herself when providing answers or explanations to the instructor. These drawings should be kept with the test documentation. Trainees should be encouraged to use facility forms, schedules, procedures, etc., to answer the questions. The supporting material should be retained by the instructor to provide additional documentation to support a pass or fail determination. The instructor should take sufficient notes during the test to facilitate the thorough documentation of the trainees' strengths and weaknesses. The instructor should be able to cross reference every comment to a specific subject area question.

The instructor should review and become familiar with the examination material. Prior to the administration of the oral examination the instructor should review any scenario questions with other instructors and discuss the required procedures and special circumstances, etc., related to the scenarios. The instructor should minimize conversation during the examination. Limiting discussions with the trainee during the test maintains some degree of formality and avoids distracting the trainee.

**Scoring the Test**

Test scoring methods will vary, depending on the purpose of the test. The most common methods are self-scoring, hand-scoring, machine-scoring, and unstructured test scoring.

Self-scoring is often used for tests where the results will not be collected by the instructor. These tests are primarily self-instructional and inform trainees of their current abilities. Self-scoring is useful for personality, interest, or career planning inventories. Answers can be provided at the end of the test, or a variety of techniques can be used to disclose the correct responses. A variation on self-scoring is to have trainees exchange papers and score them in class. This saves the instructor time and provides immediate feedback for both the instructor and trainee.

Hand-scoring is the most common scoring technique. Usually a scoring key is created on a strip of paper and placed next to the test form, or a blank test form is completed with the correct answers. For multiple choice test items, separate answer sheets can be used. An answer key can then be created by punching out the correct answers. The resulting overlay allows rapid scoring. The overlay should be made of transparent material (such as an overhead transparency) so the instructor can easily detect omitted or multiple responses.

When a large number of structured response tests are to be scored, machine-scoring may be useful. In addition to saving time, the ability to enter the results directly into a computer test data base provides many other benefits. Trainee records can be updated, test analysis data can be automatically computed to aid in test refinement and program evaluation, and reports and records can be produced easily once the initial programming is complete.

Many tests are unstructured response format. These tests cannot be machine scored but should be reviewed individually by the instructor; thus, scoring unstructured response questions consumes a great deal of time and poses some unique challenges. It takes diligence on the part of the instructor to prevent these test items from becoming subjective test items. To minimize the subjectivity in scoring any unstructured response items, several guidelines should be followed.

The instructor should compare the answer key to several of the trainees' responses to a question. Some trainees may take a different approach from what the answer key anticipated and still be correct. If so, an alternate correct answer will need to be added to the answer key. If the key is changed, all tests should then be regarded using the revised standard.

Periodically review the answer key. It is easy for an instructor's standard to change after several tests are scored. Reviewing the answer key will help protect against distraction from the standard. By occasionally reviewing those items scored earlier, the instructor can confirm that the standards are being applied consistently. Even when applying these measures, some inconsistency is inevitable. One problem is how an item response is graded following several good or several poor responses. The tendency is to score the item low if it follows several high scores, or to score the item high if it follows several low ones. Shuffling the test between review of test questions, while not eliminating the problem, allows these effects to be offset by random sequencing.

Score each item separately. Each test item should be scored for all tests before the next item is scored. Scoring one item at a time allows the instructor to concentrate on just one standard. This increases consistency when assigning points or categorizing items.

Avoid interruptions when scoring responses. The bias an instructor has toward an essay item may change. If a bias exists it should be consistently applied to the responses of all trainees. By scoring all response sets at once, if a bias exists, its effect on trainee scores will be consistent.

Provide comments and make corrections on the actual test. A trainee who does not receive full credit for an answer will want to know why. Appropriate comments can explain the score received. If trainees are to learn from their mistakes, they should be told what errors were made and how to correct them. Another value in providing comments is the ability to tally the various comments and analyze the results from test item improvement.

> **Note: You do not have to do example 2 on the following page, but it is a good time to check your skill and knowledge of the information covered. You may do the example 2 or go to section 3.**

**EXAMPLE 2**

Using the familiar level of this module and the resources, answer the following questions.

1.  What would be the order of test items when going from simple to complex?

2.  What are the three things an instructor should ensure for proper test administration?

3.  What are learning objectives?

4.   What is done to pre-script an oral test?

5.   What are the four common methods of scoring tests?

> **Note: When you are finished, compare your answers to those contained in the example 2
> self-check. When you are satisfied with your answers, go to section 3.**

**EXAMPLE 2 SELF-CHECK**

1.  What would be the order of test items when going from simple to complex?

    The order of test items when going from simple to complex are:
    - Multiple choice items
    - Matching items
    - Short answer items
    - Essay questions

2.  What are the three things an instructor should ensure for proper test administration?

    The three things an instructor should ensure for proper test administration are:
    - That a suitable environment is established
    - Consistent and clear test directions are given
    - Proper supervision is present for the entire test

3.  What are learning objectives?

    Learning objectives are objective statements that identify the knowledge and skills that are necessary to perform a job or task.

4.  What is done to pre-script an oral test?

    To pre-script an oral test, test questions should be developed prior to administration and acceptable answers should be recorded in advance along with applicable references and basis for the questions.

5.  What are the four common methods of scoring tests?

    The four common methods of scoring tests are:
    - Self-scoring
    - Hand-scoring
    - Machine-scoring
    - Unstructured test scoring

**SECTION 3, DOE-HDBK-1204-97, GUIDE TO GOOD PRACTICES FOR THE DEVELOPMENT OF TEST ITEMS**

**Introduction**

While the methodology used in developing test items can vary significantly, to ensure quality examinations, test items should be developed systematically. Test design and development is discussed in DOE-HDBK-1205-97, *DOE Guide to Good Practices for Design, Development, and Implementation of Examinations*. DOE-HDBK-1205-97 provides more detailed guidance on the development of specific test items.

**Development of Written Test Items**

These are the 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 trainee 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 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. Copying from reference material can cause confusion in test items because the material lifted often draws its meaning (and importance) from its surrounding context. Important assumptions or conditions stated elsewhere in the material are often omitted from the test item.

Avoid "backwards logic" test items—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 taker 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, 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.

**Test Item Answers and Point Value**

For each test item, a correct answer should be supplied in order to develop an answer key. The answers should be unambiguous so that the grading of the test item will be consistent. The minimum response for full credit must be given, and indications of the relative value of partial responses should be made. This kind of information is obvious in multiple-choice and matching test items, but short-answer and essay test items leave room for interpretation.

To prevent interpretive inconsistencies in grading short-answer or essay test items, the designated instructor should include the minimum answer required for full credit. If the exact wording or specific concept must be included to fulfill the requirement of a correct answer, one method that may be used is to underline the necessary information and assign point value to the individual parts. If the exact underlined wording is not necessary, include a note to the grader that the content is necessary, but the wording is left to the grader's discretion. For example:

> Test item:
> State the purpose of the emergency diesel generator. (4 points)
>
> Answer:
> Provides emergency power (2.0 points) to essential loads (1.0 point) in the event
> of a total loss of power (1.0 point). NOTE: *Alternate wording acceptable—grader discretion requested.*

After the test item and answer key are written, the point value should be assigned in a clear and consistent manner. The assignment should be based on a point scale with the "easiest" test item assigned lower point value and the "more difficult" test item assigned higher point value. The point value should be placed in parentheses at the end of the test item stem.

**Cognitive Level vs. Point Value**

To determine ease or difficulty of a test item, consider the criticality of the enabling objective that is being tested to the overall mastery of the terminal objective that will allow successful performance of the job task. Consider the cognitive level at which the objective being tested is written. For example, if you are writing multiple-choice test items for three enabling objectives, two of which are written at the knowledge level of Bloom's Taxonomy to support a third that is written at the comprehension level, then the point value assigned to the higher cognitive level would be higher than the point value assigned to the lower cognitive level.

Other considerations for determining point value of test items include the following:
- Impact on successful performance of the job task if the answer is not known by the trainee
- Learning level required (lowest being knowledge and the highest level being evaluation)
- Number of answers required for the test item
- Relative degree of difficulty

Another consideration in the assignment of point value is related to the test item. Test items having multiple parts requiring answers and matching test items should have at least one point per answer/match. Point value allocations should be made and approved when drafted test items are submitted for review and approval.

**Note: You do not have to do example 3 on the following page, but it is a good time to check your skill and knowledge of the information covered. You may do the example 3 or go to section 4.**

**EXAMPLE 3**

Using the familiar level of this module and the resources, answer the following questions.

1.  What are the three requirements of a test item?

2.  What is the definition of backwards logic?

3.  What is the purpose of placing easier test items at the beginning of each exam section?

4.  Where is the point value for a test item placed?

**Note: When you are finished, compare your answers to those contained in the example 3 self-check. When you are satisfied with your answers, go to section 4.**

**EXAMPLE 2 SELF-CHECK**

1. What are the three requirements of a test item?

   The test item should be clear, grammatically correct, and free of clues to the correct answer.

2. What is the definition of backwards logic?

   Backwards logic are those test items that ask what should be provided in the test item and provide what should be required in the trainee's response.

3. What is the purpose of placing easier test items at the beginning of each exam section?

   Place the easier test items at the beginning of each section. These test items help trainees gain composure and confidence.

4. Where is the point value for a test item placed?

   The point value should be placed in parentheses at the end of the test item stem.

**SECTION 4, DOE-HDBK-1206-98, GUIDE TO GOOD PRACTICES FOR ON-THE-JOB TRAINING**

**OJT Program Development`**

The OJT training program is designed to prepare employees for job performance through training and performance testing that is conducted by qualified OJT instructors, in the work environment. It provides practical hands-on experience, and has the advantage of providing training on tasks that are of immediate need to the employee. OJT is limited to those situations where it is administratively and physically possible to conduct the training. Instructors and training material designers/developers should be aware of the potential advantages and disadvantages of OJT when selecting training settings.

The advantages of OJT are:
- 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 the length of instruction to allow the trainee to learn the task.
- The trainee is able to practice the task and gain hands-on experience.

The disadvantages to OJT that should be considered are:
- 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. 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 a chance that a trainee may damage equipment in the process of learning to operate it.

The ultimate success of any training program requires a strong commitment to training by 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.

Accurate records that document the actions and decisions made during each OJT program's construction and revision should be maintained to serve as the audit trail. The critical portion of an audit trail is not necessarily the decisions themselves, but the rationale that let to making them. These records should be maintained on an ongoing basis.

The table-top processes for analysis, design, and development described in DOE-HDBK-1074-95, *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. DOE-HDBK-1078-97, *DOE 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 of terminal objectives, selection of appropriate training settings, and development of TES for each task selected for training. It is during the development of the TES 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.

When writing a terminal objective, the training setting must be considered. The training setting selected should be consistent with the task, but balanced against available resources and facility constraints. Guidance on writing learning objectives is contained in the DOE-HDBK-1200-97.

### Training/Evaluation Standards (TES)

The TES or equivalent document is developed for each task selected for training. The TES specifies elements, criteria, and conditions required for adequate task performance. Each TES contains two parts: a training standard and an evaluation standard. The training standard contains the task title, the terminal and enabling learning objectives, and any applicable references. The information in the training standard is used to establish entry-level requirements and forms the basis for training development activities. The evaluation standard contains a performance test that includes prerequisites (to measure the trainee's knowledge and skills on each task), amplifying conditions

and standards, and instructions to the trainee and the evaluator. The evaluation standard defines the conditions that signal a person to perform a specific task, establishes conditions under which actions occur, and establishes standards that measure knowledge and performance. It may be practical to combine the information contained in the training and evaluation standards into one document or include it in a qualification card or checklist. Figure 1 depicts the relationship of a task to a terminal objective, to a TES, and the output of the TES.
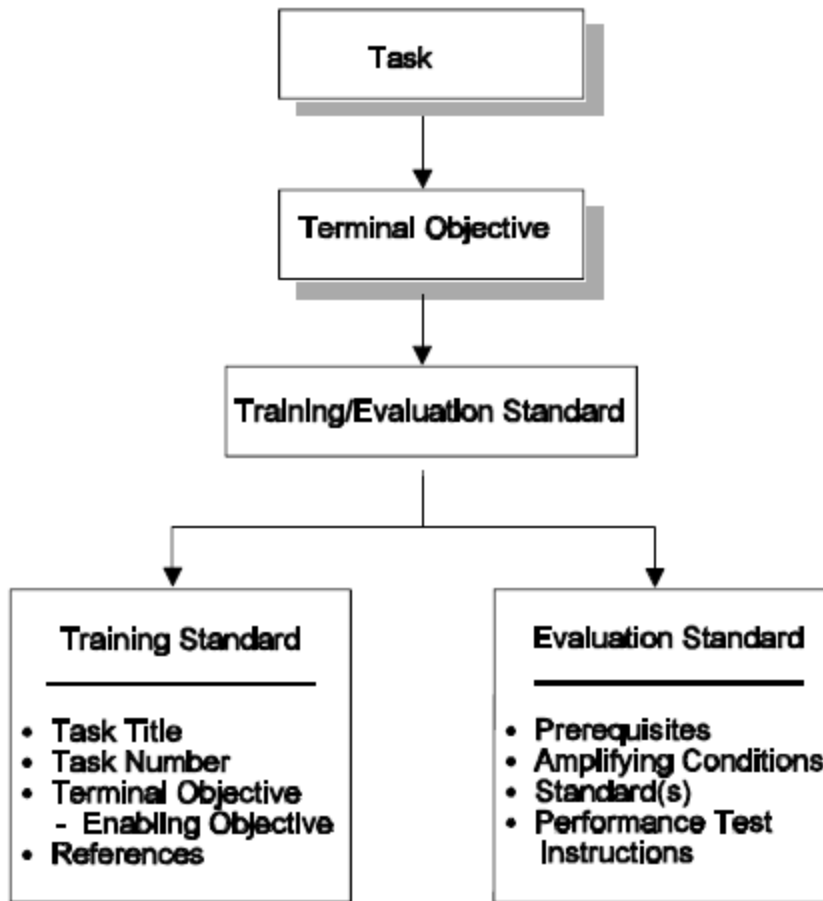


*Source*: DOE-HDBK-1206-98, April 1998.

**Figure 1. Training/Evaluation Standard**

Instructors and training material designers/developers should design each evaluation standard so that different OJT instructors will administer the test consistently. The test should require actual task performance if possible. DOE-HDBK-1205-97 contains detailed guidance for developing performance tests.

The methods of conducting OJT and the required level of accomplishing performance testing are determined during the TES development process. The acceptable level of accomplishment (perform, simulate, observe, discuss) should be specified in each TES. Certain tasks should require that a trainee demonstrate achievement of the terminal objective through actual task performance. A core of tasks that must be performed should be identified by line and training management. These tasks are typically overtrained tasks or those that may be critical to safety.

The training and performance testing an employee receives should lead to qualifying that individual to perform the task. Therefore, the majority of tasks should be performance coded as either perform or simulate. Observe and discuss are primarily used for knowledge assessments. DOE-HDBK-1206-98, *DOE Handbook: Guide to Good Practices For On-The-Job* Training, appendix A, *Performance Test Code Guidelines*, may be used to help determine the most applicable level of accomplishment for a given task.

**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. Required level/levels of accomplishing performance testing should be specified for each task. DOE-HDBK-1206-98, appendix B, *Examples of OJT Checklists*, contains two examples of OJT checklists that are in use at DOE nuclear facilities.

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 checklist. An OJT checklist should reference 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 2 illustrates the relationship of the elements that make up the most common OJT checklist.
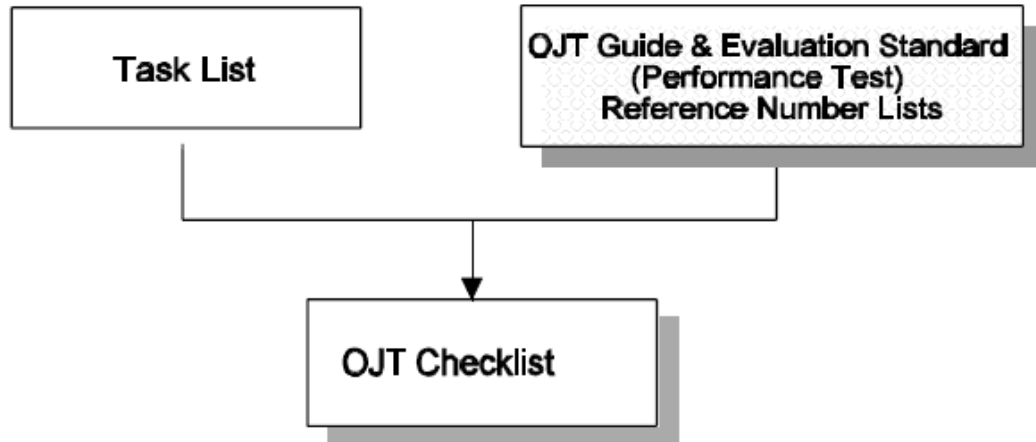
*Source:* DOE-HDBK-1206-98, April 2998.

**Figure 2. 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. The OJT training/evaluation guide in DOE-HDBK-1206-98, appendix B is an example of this format. This format, depicted in figure 3, 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.
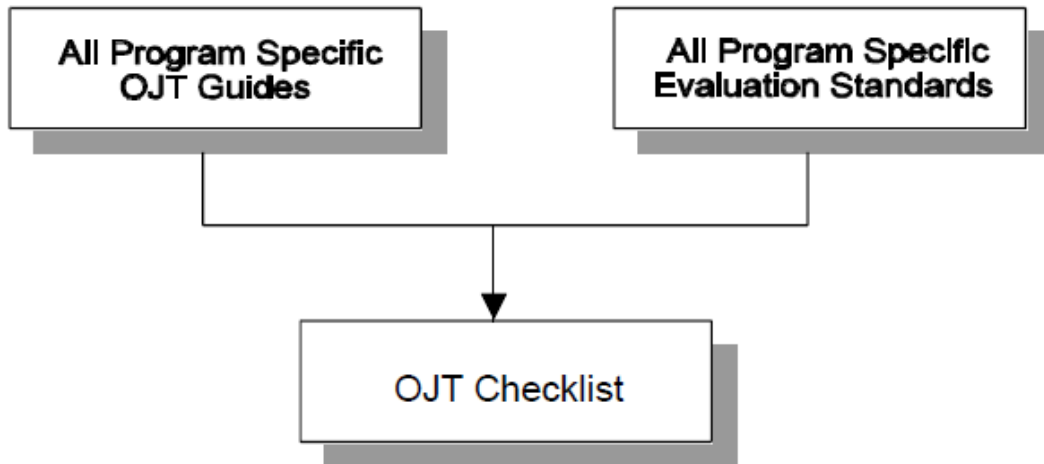


*Source:* DOE-HDBK-1206-98, April 2998.

**Figure 3. 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 standards.

OJT checklists may contain tasks that have simulated and perform specified as the acceptable levels of accomplishment. At the time of 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 quality 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. This type of information may be specified on the qualification card/checklist or in other training documents or procedures. The qualification standard may 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. Figure 4 illustrates the inputs to the qualification standard.
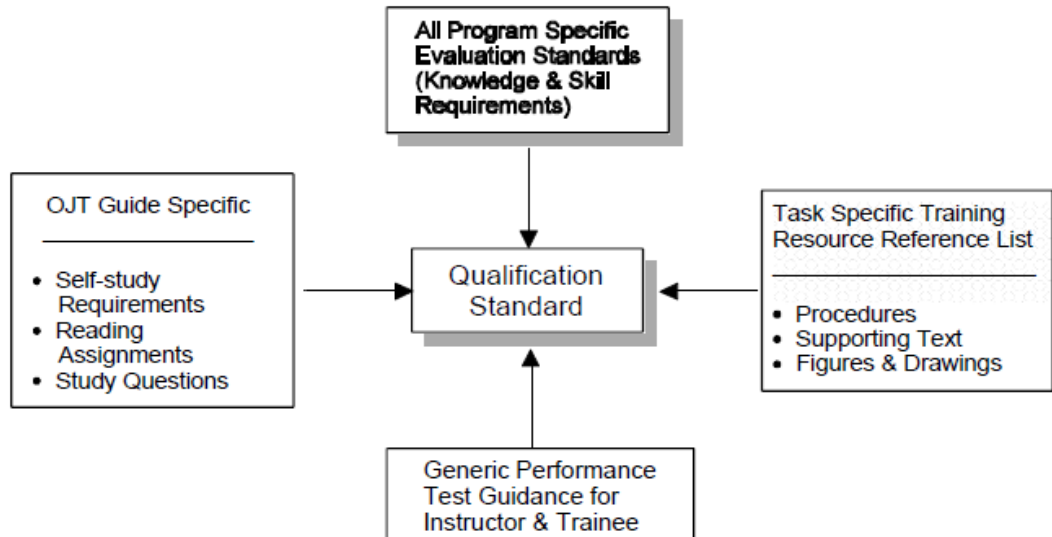
*Source:* DOE-HDBK-1206-98, April 2998.

**Figure 4. Qualification Standard Elements**

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 address (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 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 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 5.

Some may question the necessity of OJT guides for OJT 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 use of the OJT guide. It may be a part of the specific task it supports and should be organized and formatted to enhance the one-on-one learning process.
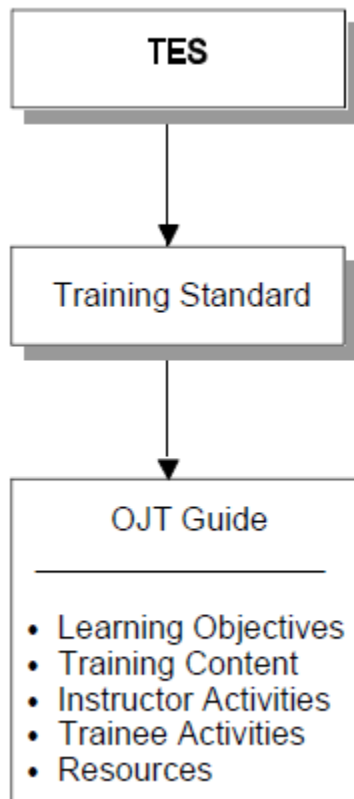
*Source:* DOE-HDBK-1206-98, April 1998.

**Figure 5. OJT Guide**

OJT guides should not contain copies of facility procedures. They should reference the appropriate procedures and provide the instructor with task specific guidance that 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 (that 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 that 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. (See: DOE-HDBK-1206-98, appendix C, *Factors That Influence Learning and Motivation*)

There are many OJT guide formats that could be successfully used for OJT 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

> **Note: You do not have to do the example 4 on the following page, but it is a good time to check your skill and knowledge of the information covered. You may do the example 4 or go on to the practice.**

**EXAMPLE 4**

Using the familiar level of this module and the resources, answer the following questions.

1.  What is the purpose of the on-the-job training (OJT) program?

2.  What are the three disadvantages of the OJT program?

3. What is the purpose of an OJT checklist/qualification card?

4. What is the purpose of qualification standards?

5. What is the purpose of an OJT guide?

**Note: When you have finished, compare your answers to those contained in the example 4 self-check. When you are satisfied with your answers, go to the practice.**

**EXAMPLE 4 SELF-CHECK**

1. What is the purpose of the on-the-job training (OJT) program?

   The OJT program is designed to prepare employees for job performance through training and performance testing that is conducted by qualified OJT instructors, in the work environment.

2. What are the three disadvantages of the OJT program?

   The disadvantages of the OJT program are:
   - 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. 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 a chance that a trainee may damage equipment in the process of learning to operate it.

3. What is the purpose of an OJT checklist/qualification card?

   OJT checklists/qualification cards should be developed to document training and performance testing.

4. What is the purpose of qualification standards?

   Qualification standards are documents that contain the knowledge and skill requirements necessary for the successful completion of a training program.

5. What is the purpose of an OJT guide?

   An OJT guide is a document that outlines instructor and trainee activities, learning objectives, training content, and the resources necessary for the consistent conduct of training.

**PRACTICE**

This practice is required if your proficiency is to be verified at the familiar level. The practice will prepare you for the criterion test. You will need to refer to the resources to answer the questions in the practice correctly. The practice and criterion test will also challenge additional analytical skills that you have acquired in other formal and on-the-job training.

1.  Fill in the blanks with the correct term or phrase.

    a.  An _____ is the release of an individual from portions of a training program on the basis of the individual's experience, education, and training that is related to their particular job.

    b.  The goal of the _____ is to ensure that technical staff personnel and managers maintain and improve their skills and are cognizant of nuclear facility physical and procedural modifications.

    c.  Technical staff personnel new to nuclear facilities should be assigned to the department they were hired to work in following the completion of the first module, initial training, and prior to _____.

    d.  The goal of the_____ is to supplement position-specific education, experience, and training in order to familiarize technical staff and managers with facility-specific information.

2. Identify the appropriate term for the definition that follows the list by placing the letter of the correct term in the space provided. Each term is used once and one definition does not fit.

   List of categories:
   (A) Exception
   (B) Backward logic
   (C) Test specifications
   (D) Learning objectives
   (E) On-the-job training (OJT) checklist/qualification card
   (F) OJT guide

**Definitions**

_____ a. A document that outlines instructor and trainee activities, objectives, training content, and the resources necessary for the consistent conduct of training.

_____ b. Release of an individual from portions of a training program on the basis of the individual's experience, education, and training that is related to their particular job.

_____ c. Statements that identify the knowledge and skills that are necessary to perform a job or task.

_____ d. A blueprint, or plan, that clearly defines the scope and content of the test.

_____ 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.

_____ f. Documentation of training and performance testing.

3. What are four of the ten basic principles that apply across all test item formats?

4. What are the four common methods of scoring tests?

5. When are challenge examinations allowed to be administered?

6. What is the purpose of the on-the-job program?

7. What are the three factors a test developer should consider when developing tests?

8. What are four of the considerations for determining point value of test items?

9. What is the purpose of a qualification standard?

10.  How are training requirements identified?

Note: The course manager will check your practice and verify your success at the familiar level. When you have successfully completed this practice, go to the general level module.