



Standard Guide for Acceptance, Checkout, and Pre-Operational Testing of a Nuclear Fuels Reprocessing Facility¹

This standard is issued under the fixed designation C 1010; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

^{e1} NOTE—Section 10, Keywords, was added editorially in November 1992.

1. Scope

1.1 This guide sets forth those criteria necessary for the acceptance, checkout, and pre-operational testing of a nuclear fuels reprocessing facility.

1.2 This guide is specifically applicable to a nuclear fuels reprocessing facility employing the Purex process; however, a large portion of this guide is also applicable to other facilities employing different processes.

1.3 This guide provides recommendations for procedure preparation, acceptance criteria following construction, training, component and systems tests, and final integrated testing. These procedures² when utilized in accordance with the prescribed quality assurance (QA) requirements should provide permanent QA records.

1.4 This guide deals primarily with the mainline aqueous/organic (Purex) sections of a nuclear fuels reprocessing facility. Operations such as fuel receipt, headend (shearing and dissolution), plutonium conversion, waste immobilization, and others of this nature are not included.

1.5 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ANSI Standard:*

N15.19 Volume Calibration Techniques for Nuclear Materials Controls³

3. Significance and Use

3.1 Most reprocessing facilities in existence today in the United States were designed to use the Purex solvent extraction

process, in either mixer settlers, pulsed columns, or centrifugal contactors to recover, purify, and separate uranium and plutonium from spent reactor fuel. The complexity of these plants and the nature of the material to be handled dictate the need for a comprehensive testing, evaluation, and documentation program following the turnover from construction through hot startup of a facility. The testing, evaluation, and documentation program must be tailored to meet applicable state and federal regulations.

3.2 The test program starts during the design and construction phases with approval of detail designs, specifications, construction procedures, and actual construction activities in new facilities and during the pre-planning stages for the restart of mothballed or partially shutdown facilities. An engineering staff must be assembled to establish the overall testing program and to prepare the necessary, written test programs and procedures. Early in the planning stages, a training program must be instituted to provide trained personnel for every phase of the startup.

3.3 Procedures for acceptance, checkout, and preparation for operation of reprocessing facilities are the primary subject of this guide and should be written in such a manner as to provide permanent, documented records of the test and training programs and their results. Since the plant is complex, a sequential testing program must be devised to test individual components, then individual systems, and finally, the entire plant as an integrated unit. This approach assures that all items in the plant are adequately tested.

4. Procedure Preparation

4.1 The planning for a smooth takeover and operation of the facility can only be accomplished by the development of a set of procedures (checkout, operations, administrative, etc.). These procedures will provide the assurance that all portions of the facility have been evaluated to the appropriate standard. Take care in setting up the format for these procedures so that they define the goals that are to be achieved, the limits within which the results are acceptable, and the approvals required for acceptance.

4.2 Divide the facility into small segments for procedure preparation. These segments shall follow the normal process system breakdown of the facility, as well as general facility

¹ This guide is under the jurisdiction of ASTM Committee C-26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.09 on Nuclear Processing.

Current edition approved Dec. 30, 1983. Published July 1984.

² Quality Assurance Programs should maintain the design intent of ANSI N46.211, Quality Assurance Requirements for the Design of Nuclear Fuel Reprocessing Facilities, and be conducted in accordance with ANSI N46.2, Quality Assurance Program Requirements for Post Reactor Nuclear Fuel Cycle Facilities.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

item breakdown such as Feed Preparation, Product Concentration, Utilities, etc. Prepare generic procedures for those components which are common to all segments (pumps, air lifts, instruments, vessels, samplers, and others of this type). Next, reference these generic procedures in the main procedures as often as required.

4.3 During this preparation period, review all aspects of preparation of the facility and prepare procedures for:

4.3.1 Acceptance of the facility from construction or turnover from mothballing,

4.3.2 Training of personnel for checkout, testing, and operation of the facility,

4.3.3 Checkout of the facility,

4.3.4 Testing in the normal operating mode,

4.3.5 Testing of emergency equipment and shutdown plans,

4.3.6 Operation of the system under normal and emergency conditions, and

4.3.7 Development of run plans which specify the conditions of operation.

5. Acceptance of the Facility

5.1 The requirement for acceptance of a facility will differ depending on its condition at the time of takeover. The three conditions reviewed for acceptance are receipt of a new facility, reactivation of a mothballed facility, and the restart of a partially operating facility.

5.2 Acceptance of a new facility is not always as smooth or as well defined as may be expected. Acceptance procedures must identify: (1) those individuals in each organization who are responsible for the turnover and acceptance, (2) the criteria used for inspection and acceptance, (3) the final conditions of acceptance or repair, or both, (4) the procedure for repair once an area has been accepted, and (5) definition of the point at which the operating organization accepts the responsibility for the facility.

5.3 The acceptance of a mothballed facility will take as much, if not more, planning than the acceptance of a new facility. Acceptance in this case shall cover everything defined in the new facility acceptance section (5.2), as well as the performance of equipment and retesting of systems previously tested by the construction organization. The procedures for this activity shall include the following:

5.3.1 A review of all operating and technical data,

5.3.2 Definition of the criteria for acceptance of a facility as it presently exists,

5.3.3 A procedure for the performance of modifications,

5.3.4 Preparation for redesign and updating of the existing design data,

5.3.5 A plan for inspecting the facility,

5.3.6 A program for leak (pressure) testing of equipment and systems, and

5.3.7 The requirements for upgrading the systems.

5.4 The acceptance of a partially operating facility will be the same as the acceptance of a mothballed facility with one exception. That exception is that procedures shall be prepared that will allow continued safe operation of those operating systems during checkout and startup.

6. Training

6.1 A certification and licensing program will be required for operating personnel in a governmental licensed and certified facility. Candidates for certification shall be required to complete a training program prior to performing in any operating position.

6.2 This training program shall be sufficiently comprehensive to include everyone from management to operators. All personnel (management, supervision, engineering, or plant operators) requiring operating certification shall complete the applicable portions of the training program.

6.3 *Training Program*—The training program can normally be divided into two segments:

6.3.1 *Formal Classroom Training*—Training that will provide the operator or technician with special academic background to assist in the subsequent understanding of the technical aspects of the facility operation that are required in developing individual job-related skills.

6.3.2 *On-the-Job Training*—Training to assist in the development of the operators' knowledge to equipment location and training on the physical operation of that equipment.

6.4 Handle training as one formal classroom training session, followed by development levels of on-the-job training or formal classroom sessions mixed with on-the-job training. The facility management, depending upon the designation of the work level, shall specify the number and type of operator classifications that will be required for operation of the facility. Establish the program so that normal progression from one level of certification to the next is allowed.

6.5 Develop the training program in stages to provide certified personnel for every phase of operation of the facility as follows:

6.5.1 For checkout, personnel shall be certified as checkout operators. This means that each individual has completed the formal classroom training and has read and understands the applicable procedures to be completed during checkout.

6.5.2 Each operator shall be trained and certified as a plant operator in the job classification before the start of chemical and integrated runs. To be certified as a plant operator, the operator shall read and understand all applicable preliminary operating procedures and shall pass operating walk-through exams on equipment specified for the job classification.

6.5.3 Prior to operations with radioactive material, the final phase is governmental licensing of certified plant operators. To qualify as a certified licensed plant operator, the candidate must be certified as a plant operator, then pass the governmental written and oral examinations required for licensing.

7. Component Tests

7.1 When the facility has been accepted from construction or turned over for modifications and testing, the first step is to individually check and test all components of the facility from the smaller line to the largest crane. In some instances, some of this checking and testing can proceed prior to formal turnover from construction.

7.1.1 *Line Checks*—These checks will start during the final stages of construction. Line checks usually involve visual