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TITLE TRITIUM SYSTEMS TEST ASSEMBLY OPERATOR TRAINING PROGRAM

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TRITIUM SYSTEMS TEST ASSEMBLY

OPERATOR TRAINING PROGRAM

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ABSTRACT

Proper operator training is needed to help ensure the safe operation of fusion facilities by personnel who are qualified to carry out their assigned responsibilities. Operators control and monitor the Tritium Systems Test Assembly (TSTA) during normal, emergency, and maintenance phases. Their performance is critical both to operational safety, assuring no release of tritium to the atmosphere, and to the successful simulation of the fusion reaction progress. Through proper training we are helping assure that TSTA facility operators perform their assignments in a safe and efficient manner and that the operators maintain high levels of operational proficiency through continuing training, retraining, requalification, and recertification.

INTRODUCTION

The detailed knowledge and experience required of operators for the operation and maintenance of TSTA is obtained through individual study, attending scheduled training sessions, and on-the-job training.

TSTA procedure manuals containing system design descriptions, subsystem specifications, operating and emergency procedures, and maintenance and calibration procedures are available to operators for individual study. Instrument and component technical manuals and subsystem and facility drawings are also readily available for reference.

TSTA TRAINING SESSIONS

Training sessions are periodically scheduled for all TSTA personnel to provide basic knowledge and familiarity with individual subsystems, TSTA as an integrated facility, and all scheduled experiments and tests. These sessions are given by personnel knowledgeable in the operation of the TSTA facility and its subsystems. Instructors may include subsystem designers, qualified operators, or safety personnel from other areas of Los Alamos National Laboratory.

All subsystem training sessions are designed to give TSTA personnel a basic introduction to individual subsystems. TSTA operators are expected to gain more in-depth knowledge of subsystems by utilizing all training and operating materials available throughout the facility.

As TSTA operation is expanded and functional subsystems are integrated into a total operating facility the training sessions will be expanded to allow operators to maintain adequate levels of knowledge to safely operate TSTA. Emphasis will be on potential accident situations with attention given to:

- methods to quickly detect and recognize abnormal conditions using existing instrumentation;
- discussion of the most stable conditions for the subsystem or facility and methods to place the subsystem or facility into that condition;
- operator actions and subsystem and facility conditions to avoid;
- discussion of potential consequences if the abnormal situation deteriorates and the immediate actions required to obtain additional assistance, minimize hazards to TSTA personnel and equipment, and to prevent the situation from expanding.

QUALIFICATION CHECKLISTS

The basic training and qualification guide is the qualification checklist. Checklists have been prepared for each TSTA subsystem and serve both as training guides for the operator by identifying the minimum items that must be completed and as a method for the qualifier, who is normally the subsystem designer or someone designated by TSTA management, to denote satisfactory completion of the specific items. All checklists are periodically reviewed to ensure their effectiveness, completeness and accuracy as training guides. Operators and

subsystem designers are responsible for keeping the checklists current with TSTA technology.

Qualification checklists address major areas of knowledge required by an operator to operate and monitor TSTA in a safe and efficient manner. All certified TSTA operators must be knowledgeable in the following areas:

- TSTA subsystems and subsystem components
- subsystem operation
- subsystem and facility operating principles
- normal and emergency operating procedures administrative procedures
- health and safety considerations

Operators demonstrate satisfactory knowledge of these areas through oral checkouts, written examinations, and the completion of practical hands-on exercises.

ORAL CHECKOUT

The oral checkout is intended to be a means of assessing an operator's level of knowledge on each subsystem. Operators are expected to demonstrate a minimum level of knowledge of the subsystem including:

- subsystem construction and function with in TSTA and the theory of subsystem operation.
- ability to draw a basic subsystem line diagram with major components
- subsystem operating modes, normal operating parameters, and control stations
- subsystem interlocks, automatic and manual features, and operating limitations
- results of subsystem or component failure and what actions to take
- basic structure of the subsystem software control program, commands allowed from the man-machine-interface and the meaning of display messages

When the operator feels confident of having mastered the required material, the qualifier giving the checkout will have a discussion with the operator. Using the qualification checklist

as a guide the operator is asked questions on the subsystem. If the operator demonstrates an adequate level of knowledge on the subsystem the qualifier who gave the checkout will sign and date the appropriate items on the checklist. If, during the oral checkout, the operator does not demonstrate a sufficient level of knowledge on a particular subject, the qualifier can require additional study and completion of that portion of the checklist at a later date.

The oral checkout is expected to take a minimum amount of time, but the actual time required will depend on subsystem complexity, anticipated operations, and whether the checkout is for initial qualification or requalification.

PRACTICAL FACTORS

Practical factors are the hands-on operations required of an operator. These are completed under the direct supervision of the subsystem designer or someone designated by TSTA management.

To satisfactorily complete the practical factors section of the qualification checklist, operators must demonstrate a detailed working knowledge of subsystem and component prestart requirements, startup and shutdown operations, normal and emergency operations, and preventive maintenance.

A detailed discussion between operator and qualifier is performed prior to the operator actually performing the operation. This includes:

- the procedure to be used and the effect the performance of the procedure will have on the subsystem and interfacing subsystems;
- precautions to be taken and subsystem or component limitations to be cognizant of;
- equipment to be monitored and normal operating conditions to be expected;
- response to any anticipated abnormal conditions;
- documentation required during operations

Practical factors are completed anytime the hands-on operation can be performed, during subsystem and facility startups and shutdowns, testing, maintenance phases, or normal operations. Every effort is made to perform the practical factors. However, if it is not possible to schedule a required operation before qualification, the practical

factor can be simulated by a walk-through of the procedure as if it were actually performed, except that valves and switches are not manipulated.

If the operator demonstrates an adequate level of knowledge, the qualifier will sign and date the appropriate section of the qualification checklist. If any practical factor is simulated, it is noted on the checklist and the operator may be required to actually perform the task at a later date.

WRITTEN EXAMINATIONS

Written examinations will be used to test the knowledge level of operators and to measure each operator's qualification progress. Examinations will be given at various stages of training as determined by the operator's qualification progress or anticipated operations and may include both written and practical sections.

After training and all qualification checklists have been completed, a comprehensive final examination will be given. All safety related questions must be answered 100% correctly or the examination must be retaken after a period of restudy.

As more operators are trained to operate TSTA, a data bank of test questions will be compiled and tests will become easier to assemble and will become more standardized.

REQUALIFICATION/RECERTIFICATION

Qualified operators must successfully complete specific requirements at regular intervals to retain certification. Operators must attend all training lectures scheduled by TSTA management and may be designated to present a training lecture. Qualified operators must successfully complete a comprehensive examination yearly which covers normal and emergency operations and subsystem and facility knowledge. Every two years qualified operators will also be required to complete the entire training program again. Operators requalifying will need to demonstrate more comprehensive knowledge and levels of understanding than required for the initial qualification. Special emphasis will be given to subsystem modifications and problems encountered since the last date of qualification.

SUMMARY

Formal operator training at TSTA is helping to ensure that operators have the knowledge not only to properly operate TSTA during steady-state and transient conditions, but to be capable of recognizing an unsafe condition and to take proper actions to either correct the problem or place the subsystems and facility into a stable and safe condition.

The basic guideline for training is that the operators not only know what actions to take, but also the reasons for taking the appropriate action and the effect that action will have on each subsystem and the facility as a whole. This detailed knowledge can only be gained through a formal and structured training program where each operator knows what his responsibilities and duties are and what knowledge is necessary to carry out those duties and responsibilities.