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12. CONDUCT OF OPERATIONS

12.1 INTRODUCTION

The purpose of this section is to provide a general description of the manner in which SMUD plans to operate and maintain the plant. The programs and techniques presented have been used successfully at a number of existing, operating, nuclear power plants and have been amplified or adapted, where necessary, to meet the District's particular needs. Special emphasis is placed on personnel training and administrative control to assure that a qualified staff is assigned to the plant and strict adherence to all plant safety regulations is maintained.

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12.2 ORGANIZATION AND RESPONSIBILITY

The organization for operations of the plant is shown in Figure 12.2-1. The plant organization has been divided into five areas of responsibility -- analyst, technical, operations, maintenance, and administrative support. The area supervisors and analyst will report to the plant superintendent and his assistant(s). The plant superintendent will be responsible for all site activities. The plant superintendent will report to the Operations Department manager who is responsible to the general manager for the operation and maintenance of generation, transmission, and distribution facilities. All plant personnel will be carefully selected and trained for their assigned duties with particular emphasis focused upon the supervisory, technical, and operating staffs to assure safe and efficient operation of the plant. Figure 1.6-2 shows the relationship of the plant staff to the total District organization and the safety review and audit committees established for this plant.

It is SMUD's intent to assign engineering personnel who are graduate engineers with appropriate experience and specialized training in their areas of responsibility. Wherever possible these positions will be filled by personnel with operating experience in their respective fields. The training program, however, has been developed to prepare an applicant with a minimum background in the field. The technical staff, engineers and technicians, will be provided with a sufficiently broad training to assure backup in all critical areas of responsibility. As an example, the mechanical engineer will have sufficient training to back up the nuclear engineer in specific areas. Selected engineers will also be licensed as AEC senior operators prior to initial fuel loading.

The Technical Supervisor is responsible for the engineering and technical work to assure proper functioning of the Nuclear Power Plant; for staffing, training, and performance of assigned technical personnel; for providing technical data for the Technical Specifications and in-house standards and procedures; for preparation of technical criteria for any required design changes; and is responsible for developing radiation protection standards and procedures.

The Operation Supervisor has functional responsibility for the operation of the nuclear plant; for participation in the planning and scheduling of work; for directing the safe and efficient use, occupancy, and upkeep of the nuclear power plant and related facilities.

The Analyst will prepare license applications and amendments; will audit the operations for the safety of operation and licensing compliance; will represent the District in relationships with the Compliance Division USAEC; will prepare routine reports as required by the operating license; and will be a member of and assigned secretary for the Nuclear Operations Safety Review Committee.

The normal operating shift will consist of one shift supervisor, one senior control operator, one control operator, one auxiliary operator, and one equipment attendant. The shift supervisors will be responsible to the operations supervisor for the safe and efficient operation of the plant

2 | during their assigned shift. The operation supervisor and shift supervisors will all be licensed as AEC senior operators prior to initial fuel loading. The senior control operators and control operators will be presented to the AEC for licensing prior to commercial operation of the plant.

1 | The maintenance force will consist of 13 men qualified to perform the electrical and mechanical maintenance of nuclear plant systems. This group, with assistance from the Hydroelectric Division, will perform all routine plant maintenance except major turbine-generator overhauls and reactor refueling. Initially, these functions - turbine-generator overhauls and reactor refueling - will be performed by outside crews, working under the direction of the District. At some future date the addition of nuclear power plants and increased personnel may justify performing of these tasks by SMUD crews. The maintenance activities will be directed by the maintenance supervisor who will report directly to the plant superintendent and his assistant.

The many special requirements of a nuclear power plant will justify the establishment of an administrative staff for this plant. These tasks include clerical and record-keeping, plant security and accommodating visitors. The administrative assistant in charge of this group will be responsible to the plant superintendent.

SMUD will have prime responsibility for the start-up program. The plant start-up organization will include all of the normal plant staff, except some of the administrative staff, plus a number of vendor and architect/engineer personnel to provide adequate coverage in all areas.

1 | SMUD is currently developing a nuclear engineering group for technical
2 | support of the plant staff (see Appendix 1C). Use also will be made of the consulting services of Babcock & Wilcox, and one or more engineering firms as required. The District currently has an engineering-consultant contract with NUS Corporation and with the Bechtel Corporation.

2 | Plant safety will be the responsibility of the plant superintendent. He will be assisted in this task by the area supervisors, analyst, and the radiation protection engineer. The radiation protection engineer is a member of the plant Technical Support Group and will have direct line of communication to the plant superintendent.

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RANCHO
OPERAT

PLANT
SUPERINTENDENT
(1)

PLANT
REVIEW
COMMITTEE

MAINTENANCE
SUPERVISOR
(1)

ANALYST
(CE, SL)

OPERAT
SUPERVISOR
(1)

MECHANICAL
SUB-FOREMAN
(2)

SHI
SUPERVISOR
(5)

MECHANIC-WELDER (4)
HELPER (2)
MACHINIST (1)

SENIOR CONTROL
OPERATOR (L)
(5)

ELECTRICAL
SUB-FORMAN
(1)

CONTROL
OPERATOR (L)
(5)

ELECTRICIAN (1)
APPENTICE (1)

AUXILIARY
OPERATOR
(5)

EQUIPMENT
ATTENDANT
(5)

REQUIREMENTS

- C COLLEGE GRADUATE
- CE COLLEGE ENGINEERING GRADUATE
- SL AEC SENIOR OPERATORS LICENSE
(includes precritical examination)
- L AEC OPERATORS LICENSE

SECO
IONS

T
T (CE, SL)

ADMINISTRATIVE
SUPPORT

IONS
(CE, SL)

TECHNICAL SUPERVISOR
(ASSISTANT PLANT SUPERINTENDENT)
(CE, SL)

ET
OR (SL)

CHEMICAL AND RADIATION
PROTECTION ENGINEER
(1) (C)

NUCLEAR
ENGINEER (CE, SL)
(1)

CHEMICAL AND RADIATION
PROTECTION TECHNICIANS
(4)

MECHANICAL
ENGINEERS (CE, SL)
(2)

INSTRUMENT AND
CONTROL ENGINEER (CE)
(1)

REFUELING
OPERATIONS

INSTRUMENT AND
CONTROL TECHNICIANS
(3)

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FIGURE 12.2-1
OPERATING ORGANIZATION
RANCHO SEECO NO. 1

TOTAL PLANT STAFF = 65



SACRAMENTO MUNICIPAL UTILITY DISTRICT

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12.3 PERSONNEL TRAINING

12.3.1 TRAINING INITIAL PLANT STAFF

The training of District personnel began in 1966 when a number of the engineering and management personnel from SMUD's operating and engineering departments enrolled in reactor engineering courses at Sacramento State College. Selected personnel have also attended manufacturer-sponsored seminars and one employee attended a nuclear engineering short course at the University of Michigan. The District has also employed a plant superintendent with a M.S. in Nuclear Engineering and ten years of operating and engineering experience in the nuclear field.

The District plans to recruit three additional members of the plant operating staff in 1968. Figure 12.3-1 is a bar chart which illustrates the District's current plans for recruiting, staffing, and training. This chart is only a guide since timing for personnel recruitment and training will largely depend upon the experience and background of those personnel recruited.

The training program of the plant staff will be under constant review by the District and the presently assigned plant superintendent. The training program has been designed to meet the requirements of the personnel selected for each position. The training period will exceed four years for some of the key personnel and be only a few months for some of the administrative staff. All off-site training will be completed prior to the start-up period to enable the District personnel to participate in the plant start-up and all ensuing activities.

The training program includes the following areas:

- Phase I. Basic reactor physics and engineering course
- Phase II. Observation of the operation of a nuclear plant
- Phase III. Nuclear steam supply system design lectures by Babcock and Wilcox
- Phase IV. Nuclear Plant Operation Training on the E&W simulator
- Phase V. Start-up activities
- Phase VI. Specialist schools and training

The primary purpose of the training program is to develop an operating staff that will assure the safe and efficient operation of our nuclear power plant. This program will also assure us of adequate AEC licensed personnel when they are required. The plant superintendent, assistant plant superintendent, operations supervisor, nuclear engineer, mechanical engineer and all the shift supervisors will obtain their AEC senior license prior to initial fuel loading as described in 10 CFR 55.25. The senior control operators and control operators will obtain their operating experience at the plant during the precritical and low power test period and will be licensed prior to commercial operation of the plant.

A brief description of the six phases of this nuclear plant staff training program follows.

12.3.1.1 Basic Reactor Physics and Engineering Course (Phase I)

1 This course will cover basic nuclear physics, reactor theory, nuclear instrumentation, health physics and nuclear power plant fundamentals. The teaching staff will include local college instructors and engineers from vendors and nuclear consultants. This course will be presented to all personnel requiring this background before proceeding with the other phases of their training. This course will be offered at several times during the training period to accommodate the plant personnel involved.

12.3.1.2 Operating Experience at a Nuclear Plant (Phase II)

2 The plant superintendent, assistant plant superintendent, operations supervisor, maintenance supervisor, all technical staff engineers, and all shift supervisors will receive observation experience at a nuclear power station following the theory course outlined above. This experience will consist of five months of observing the plant operation.

12.3.1.3 Nuclear Steam Supply System Design Lectures (Phase III)

This course is organized and presented by Babcock and Wilcox and will cover the design and basic functions of the components and systems furnished by this company. The course will be presented at Babcock and Wilcox facilities following the nuclear Plant Observation Experience and will require a period of about six weeks. This course will be attended by the plant superintendent, assistant plant superintendent, operations supervisor, maintenance supervisor, technical staff engineers, and all shift supervisors. In addition the senior control operators and the control operators will receive this course prior to reporting for on site training. This course will cover the following areas:

- 1
- a. Reactor Physics - Review of reactor physics as applied to the specific plant design.
 - b. Heat Transfer and Fluid Flow - Review of the nuclear plant design, design objectives, reactor design considerations and limitations.
 - c. Reactor Vessel and Internals - Review of the design, materials, fabrication, inspection, NDTT and purposes.
 - d. Primary Loop Components - Simplified two-loop heat transport system with a description of piping, pumps, and pressurizer relative to design considerations, analyses performed, and materials.
 - e. Once-Through Steam Generators - Description, peculiarities, heat transfer characteristics, mechanical design considerations, materials, chemistry necessities, and maintenance.

- f. Reactor Auxiliary Systems - Functional requirements (normal and emergency), design objectives, criteria, and analysis including a system-by-system description, arrangements, parameters, and equipment access and maintenance.
- g. Control Rod Drives - Description of drives and controls.
- h. Instrumentation and Control - Functional requirements and description of integrated plant control system, nuclear instrumentation and reactor protective system. Primary loop and reactor auxiliaries nonnuclear instrumentation will be covered as well as the incore monitoring system and automatic data logging and on-line computer requirements.
- i. Normal and Emergency Power Requirements - Description of functional needs and procedures.
- j. Chemistry - Water chemistry application to the nuclear plant, including radiochemistry measurements, sampling and chemical analysis.
- k. Health Physics - Review of radiation monitoring systems, decontamination methods and precautions and administrative procedures and controls.

12.3.1.4 Nuclear Plant Operational Training (Phase IV)

This last course to be given off site will be an operation training period utilizing classroom lectures, the Lynchburg Pool Reactor, and the B&W Nuclear Power Station Simulator to provide required operational experience for qualification to take the AEC precritical licensing examination. This training is directed toward the understanding and actual completion of operational procedures as they would be accomplished on an actual power station. This course consists of six weeks of classroom and operational training on the simulator, two weeks of training on the Lynchburg Pool Reactor which will include ten actual reactor startups for each trainee, and finally four weeks of shift operation on the simulator. This course will be completed by the plant superintendent, assistant plant superintendent, operations supervisor, nuclear engineer, mechanical engineer, and all shift supervisors.

12.3.1.5 Start-up Activities (Phase V)

It is anticipated that all SMUD personnel will have completed their off-site training and be ready for plant assignment with the initiation of the plant start-up activities. This phase of the training program will be organized to obtain the maximum participation of the plant staff. They will participate in:

- a. Preparing test programs and test procedures.
- b. Testing of components and systems.

- c. Preparing operating, refueling and emergency procedures.
- d. Evaluating routine and emergency operating procedures.
- e. Preparing maintenance procedures.
- f. Evaluating maintenance procedures and observing the installation of major and auxiliary systems and equipment.
- g. Preparation of the AEC operating license material with particular emphasis on the operational aspect of the technical specifications.
- h. Calibration of all instruments and control systems.

1 A few months prior to fuel loading, the personnel scheduled to obtain an operator's license for participation in fuel loading and initial operation of the reactor, will take license examinations. This will be preceded by several weeks of on-site classroom study to review the theory covered in earlier courses and to familiarize the staff with the latest developments in the station design. The procurement of the AEC Senior Operating License by this group will complete their formal initial training. The senior control operators and control operators will attend similar classes, receive actual experience on the Rancho Seco plant during the startup test program, and be presented to the AEC for licensing prior to commercial operation.

12.3.1.6 Specialist Schools and Training (Phase VI)

Engineers, technicians, and the maintenance supervisor will be involved in one or more specialized courses to prepare them for their assigned task. These courses are from two weeks to several months in duration and will provide both theoretical and practical training. The vendors will provide some of these courses, while others will be obtained at colleges and government facilities. The types of courses included in this group are nuclear engineering, fuel management, instrumentation, radiation protection, radio-chemistry and maintenance of major equipment.

12.3.2 REPLACEMENT AND REFRESHER TRAINING

The training of replacement personnel and re-training of the initial staff will be a continuing program. All plant personnel will be periodically enrolled in refresher courses or courses covering new concepts to assure the continued safe and efficient operation of the plant. These will be both on-site and off-site and will vary from short lectures on health-physics to graduate courses on nuclear physics. The training of replacement personnel in the crafts and technical areas will be handled by the District's apprentice program. This program includes both practical and theoretical training and requires a minimum of three years to produce a journeyman. There will also be cross training between the two technician fields to assure better coverage.

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Replacement personnel for the operating group will normally be obtained by promotion. A continual, on-site operator training program will be established to assure the availability of qualified personnel. Personnel in each job classification will be encouraged to train for the next position and obtain the required AEC Operator's License, where applicable. Well-qualified senior control operators will be eligible for promotion to shift supervisor. In preparation for this promotion, they will be given additional courses on the plant systems and will obtain their AEC Senior Operators License.

The replacement training for the engineers in the Technical Support Group will be based on two training programs. First, all engineers in the initial staff will be trained in an adequate number of fields to provide engineering back-up in all critical areas of responsibility. Second, one or more engineers will be provided on-site and off-site training to prepare them for several of the staff positions.

The replacement and refresher training program will be administered by the administrative assistant. The Technical Support Group will keep the program current and provide instructors for all on-site courses. The plant superintendent will have over-all responsibility for the program.

12.3.3 EMERGENCY DRILLS

All station personnel will be thoroughly familiar with the site emergency plan and practice drills will be held on a routine basis to evaluate the efficiency of the staff. All outside agencies included in the plan will be informed of the procedures and of their expected role in an emergency. Training sessions will be provided for outside personnel, when required, to assure their understanding of the procedures and the hazards involved.

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PLANT SUPERINTENDENT
(AEC SENIOR OPERATORS LICENSE)

TECHNICAL SUPERVISOR
(AEC SENIOR OPERATORS LICENSE)

PLANT ANALYST
(AEC SENIOR OPERATORS LICENSE)

OPERATIONS SUPERVISOR
(AEC SENIOR OPERATORS LICENSE)

MECHANICAL ENGINEER
(THERMAL)

NUCLEAR ENGINEER
(AEC SENIOR OPERATORS LICENSE)

INSTRUMENT AND CONTROLS ENGINEER

MECHANICAL ENGINEER
(AEC SENIOR OPERATING LICENSE)

CHEMICAL AND RADIATION ENGINEER

RADIATION TECHNICIANS (4)

INSTRUMENT AND CONTROLS TECHNICIANS (3)

SHIFT SUPERVISOR (5)
(AEC OPERATORS LICENSE)

SENIOR CONTROL ROOM OPERATOR (5)
(AEC OPERATORS LICENSE)

CONTROL ROOM OPERATOR (5)
(AEC OPERATORS LICENSE)

AUXILIARY OPERATOR (5)

EQUIPMENT ATTENDANT

MAINTENANCE SUPERVISOR

MECHANICAL FOREMAN (2)

ELECTRICAL FOREMAN (1)

ELECTRICAL AND MECHANICAL CREWS (9)

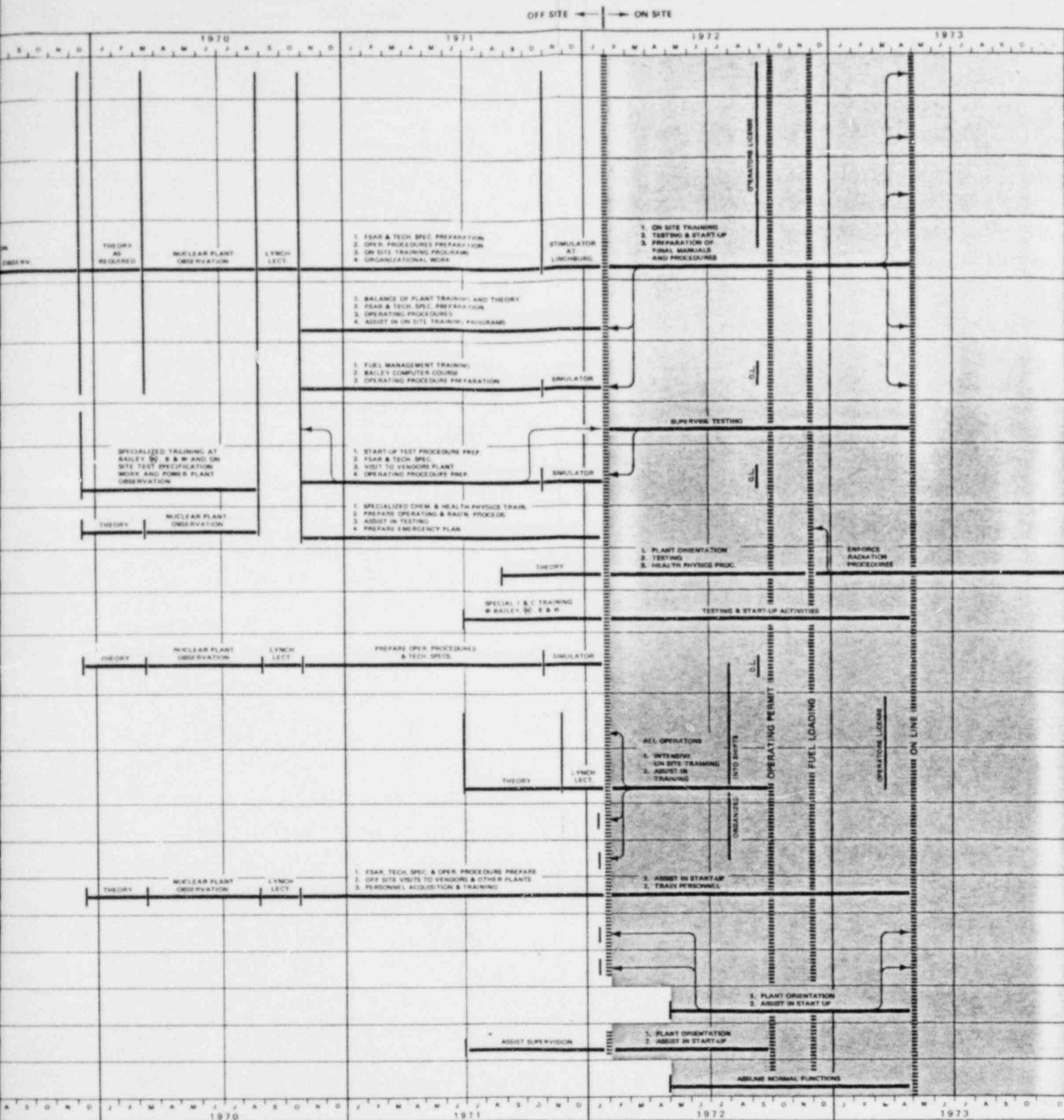
ADMINISTRATIVE AID

CLERKS, JANITORS, GUARDS (9)



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FIGURE 12.3-1
PLANT STAFFING
AND TRAINING PROGRAM



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SACRAMENTO MUNICIPAL UTILITY DISTRICT

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12.4 WRITTEN PROCEDURE

Detailed written procedures for all normal operations and abnormal and emergency conditions will be prepared and evaluated prior to initial fuel loading. These procedures will include a site emergency plan which provides the necessary pre-arrangement and organization of plant personnel to deal effectively with any foreseeable emergency at the plant site. These would include fire, medical injury or illness, radiation and contamination accidents and other conditions that may result from nuclear or non-nuclear accidents. The site emergency plan will be coordinated with the State of California and local disaster organizations. The plant will be equipped to handle all emergency conditions; however, outside agencies such as police and fire departments, State of California, local disaster organizations, the AEC, and others will be called upon if they can provide assistance during an emergency condition.

All procedures will be periodically reviewed, and revised, as necessary, to cover changing conditions or modified standards.

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12.5 RECORD

Records documenting the operation and maintenance of the plant, in accordance with District policies and AEC requirements, will be maintained. The routine operating records will include log sheets, log books, analog recordings and digital records on all significant plant parameters. Maintenance records will include inspection, calibration and maintenance history on all significant components and systems. Detailed records of the operational testing of nuclear safeguard systems and components, plant malfunctions, and other significant events will be maintained.

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12.6 ADMINISTRATIVE CONTROLS

Administrative controls will be established to assure that all operations, tests, and emergencies are handled in accordance with written procedures which have been written and approved by established channels. All proposed design modifications, proposed changes in operating and emergency procedures and proposed tests will be subject to an established review procedure. Two levels of review will be required on actions affecting plant safety. A review committee composed of operating and technical personnel from the plant staff will provide the first review. The second level of review will be performed by the Nuclear Operations Safety Review Committee composed primarily of persons from Nuclear Design and Construction. Tests or changes that do not affect plant safety will require approval of the Nuclear staff from the office of the assistant chief engineer.

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12.7 INDEPENDENT AUDIT OF PLANT OPERATIONS

In addition to the "in house" controls mentioned in 12.6, an independent audit of plant operation with particular emphasis on safety, will be conducted as required. This audit will be made by outside consultants not otherwise directly involved in the nuclear operation. They will make periodic unannounced visits to the plant, examine logs, interview personnel, and otherwise observe operations. Their findings will be reported directly to SMUD's general manager and chief engineer.

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