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AUTH. NAME: AUTHOR AFFILIATION
 HERING, R.F. Indiana & Michigan Electric Co.
 RECIP. NAME: RECIPIENT AFFILIATION
 DENTON, H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards response to SA Varga 821112 request for addl info re upgrading of reactor operator & senior reactor operator training & qualification & training for mitigation core damage.

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 the land owned by the United States in the State of California.
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 situated in the Township of San Marcos, Range 12S, and
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The land is situated in the Township of San Marcos, Range 12S, and
 Section 36, T. 12S. R. 12E. S. 36.

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INDIANA & MICHIGAN ELECTRIC COMPANY

P. O. BOX 18
BOWLING GREEN STATION
NEW YORK, N. Y. 10004

December 28, 1982
AEP:NRC:0678C

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-315 and DPR-74
UPGRADED SRO AND RO TRAINING AND TRAINING FOR MITIGATING CORE DAMAGE

Mr. Harold R. Denton, Director
Office of Nuclear Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

This letter and its attachments respond to Mr. Steven A. Varga's request for additional information on the upgrading of Reactor Operator and Senior Reactor Operator training and qualification; and training for Mitigating Core Damage, contained in his letter to Mr. John Dolan (AEP) dated November 12, 1982.

Attachment 1 to this letter contains our responses to the three questions raised in the enclosure of Mr. Steven A. Varga's letter dated November 12, 1982. Attachment 2 to this letter contains the current SRO and RO Training programs which reflect the revisions we have made since our previous submittal.

This document has been prepared following Corporate Procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to the signature by the undersigned.

Very truly yours,

R. F. Hering
R. F. Hering
Vice President

A001
Limited Dist

:md

cc: John E. Dolan - Columbus
M. P. Alexich
R. W. Jurgensen
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Charnoff
Joe Williams, Jr.
NRC Resident Inspector at Cook Plant - Bridgman
R. S. Hunter

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ATTACHMENT 1

NRC REQUEST FOR ADDITIONAL INFORMATION ANSWERS

Our previous submittals contained the then current Operator Training and Retraining programs. These programs have since undergone minor revisions and are enclosed for your information and use.

Answers to your questions regarding the training programs are as follows:

1. Our training covers all areas identified in the Denton letter of 3/28/80. The level of detail, however, is not to the depth specified. The specific area that is not covered to the detail specified is Item #6, Burnout and Flow Instability. Mr. Denton's letter states: "This section should cover descriptions and mechanisms for calculating such terms as critical flux, critical power, DNB ratio and hot channel factors." It also says that: "Sample calculations should be illustrated by the instructor and calculations should be performed by the students and discussed in the training sessions."

The basic concepts which form the body of the calculation of each of the above mentioned terms are taught in the training program. However, to imply that we teach the detailed descriptions and mechanisms of calculating each of these terms is to imply too much. The four terms which have been mentioned are in actuality calculated by means of running specific computer programs which have been written to perform this task. We feel that training reactor operators in the use of these programs and the computers themselves is beyond the scope of what is needed by a reactor operator. We further feel that having the trainees perform sample calculations is also beyond the scope of what is necessary. Basic calculations, such as determining the total peaking factor from the radial and axial peaking factors are performed by the trainees as a part of our training program to illustrate the student's understanding of the terms.

For the above reasons we feel that what we teach is sufficient for operators but does not meet the full detail of Mr. Denton's 3/28/80 letter.

2. The Plant Manager at the time the initial training was conducted could not attend due to his work load managing the plant being too great to allow being away for a full week. In lieu of this the Assistant Plant Manager - Operations attended the training and will act in the Senior Licensed Management position during accident mitigation.

The present Plant Manager, since filling this position 1/1/82, has been unable to attend the one scheduled training session since his arrival also due to management responsibilities requiring his time. The current Plant Manager will attend this training at the next training sessions to be conducted for Core Damage Mitigation. This training is scheduled to be conducted in February 1983.

3. The first part of your question concerns the depth of coverage of the subjects of heat transfer, fluid flow and thermodynamics. The basic concepts of these subjects are taught in the Requalification Training Program. We do not, however, teach an entire heat transfer, fluid flow or thermodynamics in-depth training course every requalification cycle. Calculations involving these subjects are usually performed by means of computer programs. Again, we feel that training reactor operators in the use of these programs and the computers themselves is beyond the scope of what is needed by a reactor operator.

The second part of your question asks to explain how all referenced subjects can be adequately covered in 40 hours of lectures annually.

Generally speaking, Requalification lectures are conducted for 50 to 70 hours annually. Keep in mind, however, that this is strictly lecture time and does not include study or examination times.

Further, the Requalification Training program is not designed to cover all identified subject areas in the total depth required for initial license training. The program was designed to identify and correct weaknesses in these subject areas. We feel, the 30 hours minimum is adequate lecture time annually to correct weaknesses. We do however, conduct nearly double the specified minimum 30 hours of lectures in order to maintain operator knowledge as high as possible, and to refresh knowledge not specifically identified as deficient.

8301040226

ATTACHMENT 2
TO AEP:NRC:0678C
NRC REQUEST FOR
ADDITIONAL INFORMATION
ON OPERATOR TRAINING



INDIANA & MICHIGAN ELECTRIC COMPANY

DONALD C. COOK NUCLEAR PLANT
P.O. Box 458, Bridgman, Michigan 49106
(616) 465-5901

November 10, 1982

Mr. Joseph McMillen
Section Head
Operator Licensing Branch
Region III
United States Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Mr. McMillen:

Enclosed is the Donald C. Cook Plant Licensed Operator Regualification Program, Revision 2. This revision has incorporated the changes to the Nuclear Regulatory Commission licensed operator written examinations, and other small program changes, such as renumbering the Attachment sheets. If there are any comments or questions concerning this revision, please contact me at the Donald C. Cook Nuclear Plant training facility.

Sincerely,

Phillip C. Craig
PHILLIP C. CRAIG, Training Instructor

/jc

cc: Mr. D. Beckham
RQ File

DC COOK NUCLEAR PLANT
TRAINING PROGRAMS
REVIEW AND APPROVAL SHEET

OPERATOR REQUALIFICATION TRAINING

DATE PREPARED OR REVISED: July 1982

PREPARED BY:

P.C. Craig

REVIEWED BY:
(Applicable Department
Head Minimum)

David M. Nelson 8/30/82
D. D. NELSON, Training Coordinator Date

K. R. Baker 9/22/82
K. R. BAKER, Operations Superintendent Date

B. A. Svensson 10/8/82
B. A. SVENSSON, Assistant Plant Manager Date

APPROVED: W. G. Smith, Jr. 10/11/82
W. G. SMITH, JR., Plant Manager Date



INDIANA & MICHIGAN ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT
LICENSED OPERATOR REQUALIFICATION PROGRAM

I. Licensed Operator Requalification Program

A licensed operator requalification program designed to maintain a continuing high degree of knowledge and proficiency as required by 10 CFR 50 and 10 CFR 55 Appendix A, is established for the Donald C. Cook Nuclear Plant Units 1 and 2. It applies to all NRC licensed operators and senior licensed operators, including operators and senior operators who perform such duties on an infrequent basis. A site appointed Training Coordinator has been assigned to administer this program.

The Training Coordinator is responsible for implementing the Licensed Operator Requalification Training Program. Licensed training personnel are exempt from those provisions of the requalification program for which they have primary responsibility for administering. For example, an individual who prepares, administers, and grades a written examination need not take the examination. This exemption provision applies to a maximum of two individuals for a particular lecture, examination, or course.

The licensed operator requalification program is conducted on a two year cycle. The two year requalification cycle was divided into requalification year one and requalification year two. Subsequent cycles will be designated year three and four, etc. Each requalification year runs from Labor Day to Labor Day.



The requalification program shall consist of:

- A. Formal classroom lectures.
- B. On-the-job training (including simulator training).
- C. An annual evaluation.
- D. Training documentation.

A. Formal Classroom Lectures

Formal classroom lectures shall be conducted each requalification year on a school year schedule running from Labor Day to Memorial Day.

Lectures shall be conducted in the following areas with emphasis on identified weak or problem areas:

1. Theory and Principles of Operation (includes Thermodynamics, Heat Transfer and Fluid Flow).
2. General and Specific Plant Operating Characteristics.
3. Plant Instrumentation and Control Systems
4. Plant Protection Systems.
5. Engineered Safety Systems.
6. Normal, Abnormal and Emergency Operating Procedures.
7. Radiation Control and Safety.
8. Technical Specifications.
9. Applicable portions of Title 10, Chapter 1, Code of Federal Regulations.

The use of training aids such as videotapes or films may be used in lieu of an instructor. However, no more than 50 percent of the lecture series shall be solely videotape or film.

The annual lecture series will be of an estimated length of 40 hours but, in no case, less than 30 hours. Lectures shall be evenly spaced throughout the period, taking infrequent operations such as refueling operations into account. Licensed operators may be exempted from attendance in a particular subject area if they have attained a grade of equal to or greater than 80% in the related areas of the previous year's annual written examination.



Written quizzes will be administered after each lecture topic for the evaluation of individual knowledge level and progress. A minimum grade of 80% is acceptable. A grade of less than 80% will require additional training in the identified areas of weakness.

B. On-The-Job Training

On-the-job training shall consist of:

1. Performance of control manipulations (simulator training).
2. Abnormal and emergency procedure review.
3. Keeping abreast of all facility and procedure changes.

1. Control Manipulations

Each licensed operator shall, during each two-year requalification training cycle, perform a minimum of plant control manipulations which demonstrate his skill and/or familiarity with plant control systems. Each licensed senior operator shall either manipulate the controls or direct or evaluate the activities of others during these control manipulations. Credit for a manipulation shall be limited to the one operator performing the task and one senior operator engaged in directing the operation.

Normal control manipulations, such as plant or reactor startups, must be performed. Control manipulations during abnormal or emergency conditions may be walked through with and evaluated by a member of the training staff; however, preference is to perform these manipulations at an appropriate simulator.

The following control manipulations shall be performed during each two-year requalification cycle. The starred items shall be performed annually.

PWR

- *1. Plant or reactor startups to include a range that reactivity feedback from nuclear heat addition is noticeable and heatup rate is established.
2. Plant shutdown.
- *3. Manual control of steam generators and/or feedwater during startup or shutdown.
4. Boration and/or dilution during power operation.
- *5. Any significant (greater than 10%) power changes in manual rod control.
- *6. Loss of coolant, including:
 - a) Significant steam generator leaks.
 - b) Inside and outside primary containment.
 - c) Large and small, including leak-rate determination.
 - d) Saturated Reactor Coolant response.
7. Loss of electrical power (and/or degraded power sources).
- *8. Loss of core coolant flow/natural circulation.
9. Loss of condenser vacuum.
10. Loss of Essential Service Water.
11. Loss of shutdown cooling.
12. Loss of component cooling water system or cooling to an individual component.
13. Loss of normal feedwater or normal feedwater system failure.
- *14. Loss of all feedwater (normal and emergency).
15. Loss of protective system channel.
16. Mispositioned control rods(s) (or rod drops).
17. Inability to drive control rods.
18. Conditions requiring use of emergency boration.
19. Fuel cladding failure or high activity in reactor coolant or offgas.
20. Turbine or generator trip.
21. Malfunction of Automatic Control System(s) which affect reactivity.
22. Malfunction of reactor coolant pressure/volume control system.
23. Reactor Trip.
24. Main steam line break (inside or outside containment).
25. Nuclear instrumentation failure(s)

*Required at least annually



Even if the above manipulations are not needed to be accomplished at a simulator, each licensed operator shall attend a training session at an appropriate simulator annually.

2. Abnormal and Emergency Procedure Review

Abnormal and emergency procedures shall be reviewed by all licensed operators on a regularly scheduled basis as assigned by the Training Coordinator. The procedure review shall normally be accomplished by conducting shift group discussions or by self-study. All abnormal and emergency plant operating procedures shall be reviewed at least annually.

3. Facility Design Change, Procedure Change and Facility License Change Review

All licensed operators shall review on a continuous basis all changes in facility design, operating procedures and the facility license. The determination of the depth of review of any changes shall be made by the Training Coordinator or cognizant Department Head. Reviews shall be conducted by one of the following methods:

- 1) Formal training lectures, to be scheduled and conducted during requalification lectures.
- 2) Individual review, to be read by the individual during his normal work hours. Questions to be directed to the Training Department.
- 3) Shift group discussion, to be conducted by the Shift Supervisor.

C. Annual Evaluation

All licensed operators shall be evaluated annually prior to Labor Day by participation in an oral and a written examination.



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Annual Oral Examination

All licensed operators shall receive an oral examination from someone of the plant management staff other than the individual's shift members or immediate shift supervisor annually prior to Labor Day. The oral examination shall be designed to:

1. Evaluate each operator's understanding of the operation of systems and components and knowledge of operating procedures.
2. Evaluate each operator's competency and knowledge of action to be taken during actual or simulated abnormal and emergency conditions.

An operator failing to achieve a satisfactory evaluation on the annual operating examinations shall be placed into an accelerated training program developed to correct the identified weakness. The scope and duration of each accelerated training program shall be based on management evaluation in each instance it is required. Following completion of the accelerated training program, the operator shall be required to take and pass a second oral evaluation.

Annual Written Examination

All operators shall receive a written examination comparable to the NRC examinations annually prior to Labor Day to determine the effectiveness of the over-all requalification program and to define those areas where additional emphasis is required. A grade of 80% or greater in a particular area will exempt the individual from attendance at lectures in this area during the upcoming requalification year. An overall grade average of less than 80% or any category grade of less than 70% shall require the individual to be placed on an accelerated training program prepared to correct the identified weakness. The scope and duration of the accelerated training program shall be based upon management evaluation in each instance it is required. During participation in this accelerated training program, the operator shall not be placed in a position where he is performing licensed duties. Following completion of the accelerated training program, the operator shall be required to take and pass a second written examination in those areas in which he was deficient.

D. Training Program Documentation

Copies of the following requalification records shall be maintained for two (2) years following the date of recorded event or requalification program completion:

1. Licensed Operator Requalification Summary.
2. Topic quizzes, answers given by licensee and quiz answer key.
3. On-the-job training records.
4. Change review records.
5. Annual written examination, answers given by licensee and answer key.
6. Annual oral examination reports.
7. Accelerated training programs (if assigned).

A permanent record shall be maintained for each operator containing verification of each program completion and the overall grade scores for the two (2) year program. This permanent record file shall be maintained for the life of the facility and conform with the requirements of 10 CFR 55 Appendix A.

Senior Operator License Limited to Fuel Handling

A licensed operator requalification program designed to maintain a continuing high degree of knowledge and proficiency as required by 10CFR50 and 10CFR55, Appendix A, shall be established for the Donald C. Cook Nuclear Plant when and if personnel are licensed as a Senior Operator Limited to Fuel Handling. It shall apply to plant personnel that are licensed Senior Reactor Operators Limited to Fuel Handling (licensed fuel handlers) that are required to routinely supervise fuel handling operations, as well as those who perform such duties on an infrequent basis. The Training Coordinator has been assigned to administer this program.



The Senior Operator Licensee Limited to Fuel Handling requalification program shall be conducted on a two-year cycle, commencing at the time of initial plant licensing. The requalification program shall consist of:

- A. Formal classroom lectures.
- B. On the job training.
- C. An annual evaluation.
- D. Training documentation.

A. Classroom Lectures

Senior Operators Limited to Fuel Handling (SROL) shall be responsible for all the requirements of those in paragraph one of the Licensed Operator Requalification Program as it relates to fuel handling as follows:

- 1. Reactor and Fuel Characteristics.
- 2. Equipment and Instrumentation, Description and Design.
- 3. Procedures and Limitations.
- 4. Emergency Systems and Safety Devices.
- 5. Health Physics and Radiation Protection.
- 6. Technical Specifications.

The annual lecture series for an SROL will be an estimated length of 20 hours, but, in no case, less than 16 hours.

B. On The Job Training

Senior Operators Limited to Fuel Handling (SROL) shall be responsible for all requirements of those in paragraph B of the Licensed Operator Requalification Program with the following exceptions:

- 1. All the requirements of B1.
- b. That portion of B2 dealing with on-shift discussions. These discussions will be held during day shift and shall be conducted by the Fuel Handling Foreman.



C. Annual Evaluation

Senior Operators Limited to Fuel Handling (SROL) shall be responsible for all requirements of those in paragraph three of the Licensed Operator Requalification Program with the following exception: the scope of the oral and written examination shall be commensurate with the lectures, and within the five (5) categories enumerated in paragraph A.

D. Training Documentation

Senior Operators Limited to Fuel Handling (SROL) records shall be maintained for two (2) years following the date of recorded event or requalification program completion:

1. Licensed Operator Requalification Summary.
2. Topic Quizzes, answers given by licensee and answer key.
3. On-the-job training records.
4. Change review records.
5. Annual written examination, answers given by licensee and answer key.
6. Annual oral examination reports.
7. Accelerated training programs (if assigned).

A permanent record shall be maintained for each Senior Operator Limited to Fuel Handling containing verification of each program completion and the overall grade scores for the two (2) year program. This permanent record file shall be maintained for the life of the facility and conform with the requirements of 10 CFR 55 Appendix A.

II. Licensed Operator Requalification Training Program Implementation

The DC Cook NRC Licensed Operator Requalification Program is designed to maintain an organization fully qualified to safely operate Cook Units 1 and 2 and the associated auxiliary equipment. The Program satisfies the requirements of 10 CFR 55, Appendix A, and meets the commitments made in the Licensed Operator Requalification Program submitted to and approved by the NRC. All licensed staff members will participate in the requalification program to the extent that their normal duties exclude the need for retraining in specific areas.

Non-licensed operators in the Operations group are required to participate in training eventually leading to an NRC license and, as such, do not require retraining in their existing positions.

Program Description

The NRC Licensed Operator Requalification Program is conducted under the guidance of the DC Cook Training Coordinator. The program complies with the requirements to 10 CFR 55, Appendix A, and the commitments made in the Cook Requalification Program submitted to the NRC.

The overall requalification program schedule is illustrated in Figure 1. The requalification program is conducted for a continuous two year cycle, Memorial Day to Memorial Day, and upon its conclusion a successive requalification program is immediately initiated. Each requalification cycle is divided into two (2) halves designated requalification year one (1) and requalification year two (2) respectively. Subsequent cycles will be designated year three (3) and year (4), etc.

The requalification program for each requalification year consists of a lecture series, on the job training and annual written and oral examinations.

Lecture Series

A lecture series begins following Labor Day and runs through Memorial Day of the following year. Normally, lectures will be given throughout the period. Mandatory lecture attendance is determined by the annual written simulated NRC examination administered at the conclusion of the previous requalification year.

On The Job Training

On the job training is conducted throughout the entire requalification year. On the job training consists of:

1. Performance of Plant Control Manipulations.
2. A shift abnormal and emergency procedure and periodic review program.
3. Keeping abreast of design changes, procedural changes and license changes.

Annual Examinations

Oral and written examinations are given annually at the conclusion of each requalification year.

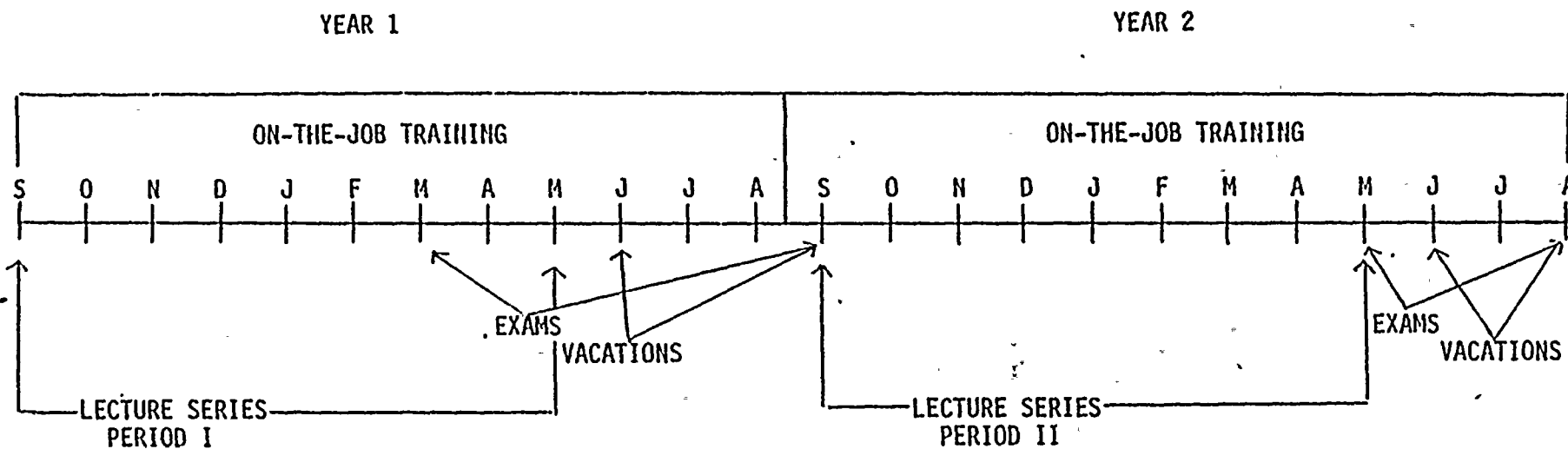


FIGURE 1. TYPICAL OVERALL NRC LICENSED OPERATOR REQUALIFICATION PROGRAM SCHEDULE



Lecture Series

All NRC licensed personnel shall normally attend 40 hours of lecture per year, except as exempted by the results of the annual written examination. Videotape or film presentations may be used to supplement the scheduled lecture series.

The requalification program lecture series consists of nine topics required for licensees depending upon their annual written examination performance. The topics are:

1. Theory and Principles of Operation.
2. General and Specific Operating Characteristics.
3. Plant Instrumentation and Control.
4. Radiation Control and Safety (Applicable Portions of Title 10, Chapter 1, CFR).
5. Plant Protection Systems.
6. Engineered Safety Systems/Technical Specifications.
7. Features of Facility Design.
8. Normal, Abnormal and Emergency Procedures.
9. Heat Transfer, Thermodynamics and Fluid Flow.

Following the completion of the previous requalification year annual written examination, the Training Coordinator will utilize the "Cook Licensed Operator Requalification Summary" (Attachment #1 or #2 Part A) to determine the lectures that each operator will be required to attend during the upcoming lecture period. A grade of less than 80% on any specified section of the written examination will require lecture attendance on a related subject. For example, an individual who receives less than 80% on all sections of the written examination will be required to attend up to 40 hours of lecture during the upcoming lecture series while another individual receiving a grade greater than 80% in all sections may not be required to attend any lectures. The number of hours of lecture under each lecture topic and lecture titles will be based on operator exam performance and noted operator weak areas.



Each requalification year lecture series begins after Labor Day and runs through to Memorial Day of the following calendar year. Lectures are not normally held during the months of June, July and August due to the heavy vacation schedule. Since 40 hours of lecture are scheduled during the nine month period, lectures will normally be given at the rate of at least eight hours per shift cycle.

The Training Coordinator is responsible for the conduct of the requalification training lectures. As such, he will establish training dates, determine detailed lecture content, assign lecturers for each lecture.

Shift Supervisors are responsible for ensuring that operators attend required training lectures on the training dates specified by the Training Coordinator. Although licensed operators are required to attend only those lectures where they have received less than 80% in the corresponding section of previous requalification year written examination, all licensed operators will be encouraged to attend.

The assigned lecturer is responsible for delivering a well-prepared lecture. Lecture attendance will be documented on Attachment #9 and returned to the Training Coordinator for documentation in the licensee's "Licensed Operator Requalification Summary" (Attachment #1/#2).

Written quizzes will be administered at the conclusion of each lecture series topic. Quiz grades will be recorded in the licensee's "Licensed Operator Requalification Summary" (Attachment #1/#2) and the quiz retained in the individual's training record.



For those whose attendance was mandatory at the lecture, a grade less than 80% on the quiz will indicate a need for additional training in that subject. Additional training normally consists of reviewing the material referenced in the lesson plan. After the material has been reviewed, the operator is required to demonstrate satisfactory knowledge of the subject by either passing a second quiz or an oral examination on that topic. Completion of the second quiz or oral examination will be documented by the examiner in the appropriate location of Attachment #1/#2.

"Satisfactory" will be entered in the "quiz retake grade" section following the satisfactory completion of an oral re-examination.

A similar procedure is followed if an individual who is required to attend a lecture is, for unavoidable reasons, unable to attend. After reviewing the material contained in the lesson plan, he is required to complete a quiz on that topic as specified in the previous paragraph. Completion of the lecture is documented in the normal manner, with the exception that under lecture "length," the Training Coordinator will affix his signature instead of documenting the length of the lecture.

On The Job Training

On the job training consists of:

1. Performance of Plant Control Manipulations.
2. Participation in shift abnormal and emergency procedure and periodic review programs.
3. Keeping abreast of design changes, procedural changes and license changes.

Plant Control Manipulations

Each licensed operator shall, during each two-year requalification training cycle, perform a minimum of plant control manipulations which demonstrate his skill and/or familiarity with plant control systems. Each licensed senior operator shall either manipulate the controls or direct or evaluate the activities of others during these control manipulations. Credit for a manipulation shall be limited to the operator performing the task and one senior operator engaged in directing the operation and one senior operator evaluating the operation.



Normal control manipulations, such as plant or reactor startups, must be performed. Control manipulations during abnormal or emergency situations may be walked through with and evaluated by a member of the training shift; however, preference is to perform these manipulations at an appropriate simulator.

The following control manipulations shall be performed during each two-year requalification cycle. The starred items shall be performed annually.

PWR

- *1. Plant or reactor startups to include a range such that reactivity feedback from nuclear heat addition is noticeable and a heatup rate is established.
2. Plant shutdown.
- *3. Manual control of steam generators and/or feedwater during startup or shutdown.
4. Boration and/or dilution during power operation.
- *5. Any significant (greater than 10%) power changes in manual rod control.
- *6. Loss of coolant, including:
 - a) Significant steam generator leaks.
 - b) Inside and outside primary containment.
 - c) Large and small, including leak rate determination.
 - d) Saturated reactor coolant response.
7. Loss of electrical power (and/or degraded power sources).
- *8. Loss of core coolant flow/natural circulation.
9. Loss of condenser vacuum.
10. Loss of essential service water.
11. Loss of shutdown cooling.
12. Loss of component cooling system or cooling to an individual component.
13. Loss of normal feedwater or normal feedwater system failure.
- *14. Loss of all feedwater (normal and emergency)
15. Loss of protective system channel.
16. Mispositioned control rod(s) or rod drops.

17. Inability to drive control rods.
18. Conditions requiring use of emergency boration.
19. Fuel cladding failure or high activity in reactor coolant or offgas.
20. Turbine or generator trip.
21. Malfunction of automatic control system(s) which affect reactivity.
22. Malfunction of reactor coolant pressure/volume control system.
23. Reactor trip.
24. Main steam line break (inside or outside containment).
25. Nuclear instrumentation failure(s).

*Required at least annually

Even if the above manipulations are not needed to be accomplished at a simulator, each licensed operator shall attend a training session at an appropriate simulator annually.

Plant control manipulations are documented on Attachment #4 (Record of Plant Control Manipulations).

Attachment #4 will be reviewed by the Training Coordinator Prior to attending simulator training to determine which manipulations must be performed during this training year.

Upon completion of the Operator Requalification Training Year the Training Coordinator will review Attachment #4 and record its completion in Attachment #1 and #7 or #2 and #7.



Shift Abnormal and Emergency Procedures and Periodic Review Program

In order to ensure that operators keep abreast of abnormal and emergency procedures and other subjects important to continued safe plant operations, a shift review program has been established.

Shift review assignments are made periodically by the Training Coordinator by routing appropriately filled out copies of Attachment #5, "Shift Review Form," to each licensed operator. Attachment #5 not only contains a list of materials to be reviewed but also space to indicate the method by which the review was completed.

Normally, a discussion session will be held by the Shift Supervisor to review the material listed on Attachment #5. If personnel are unable to attend the session, they are required to review the referenced material by themselves.

After each licensee has completed the shift review, he or she will sign and date Attachment #5 and return it to the Training Coordinator. The Training Coordinator then documents completion of the periodic shift review in Attachment #1 or #2.

Facility Design Change, Procedure Change and Facility License Change Review

Significant changes in facility design, facility license and procedures will be reviewed by all NRC licensed operators. The Training Coordinator is responsible for listing items to be reviewed on Attachment #8 and routing this form to all licensed personnel. Each licensed operator is responsible for reviewing these revisions and documenting this review on Attachment #8.

When all personnel have completed the review, the Training Coordinator collects the completed form and maintains it in a chronological file for a period of two (2) years.

Annual Oral Examination

At the conclusion of each requalification year, the Training Coordinator or designated station staff member will administer an oral examination to each licensed operator. During the walkthrough special emphasis is given to the operator's knowledge of the operation of equipment and procedures in addition to operator response to actual or simulated abnormal and emergency conditions. Those licensed station staff members designated by the Training Coordinator to administer an annual oral examination may not be required to take an oral examination themselves.

The plant walkthrough examination will be conducted utilizing Attachment #3, "Operating and Oral Examination Summary Report." Completion of the walkthrough will be documented in Attachment #1 and #7 or #2 and #7.

The annual oral examination is a sat/unsat. examination. If the performance of any operator is unsatisfactory, the operator will be placed in an accelerated training program to correct the deficiencies noted. This training program will be assigned by the Training Coordinator based upon weak areas noted in the oral examination. The content of the accelerated review program will be documented on Attachment #6, "Accelerated Training Record." After the review program has been completed, the operator is required to demonstrate satisfactory knowledge in the identified weak area by receiving a second oral examination from either the Training Coordinator or the original oral examiner. The sequence of events to be followed after an oral examination failure is outlined in Attachment #1 or #2 page 7 of 8.

Annual Written Examinations

An operationally oriented, simulated NRC written examination will be administered to all NRC licensed operators at the conclusion of each requalification year. This examination, which will be prepared and graded by the Training Coordinator, will serve as the basis for determining required lecture attendance for the upcoming year's lecture series.



The results of each individual's annual examination will be recorded in Attachment #1 and #7 or #2 and #7. An individual failing to achieve an overall examination grade of 80%, or 70% in any category, will immediately be removed from licensed duties and placed into an accelerated training program.

The content of the accelerated training program will be documented on Attachment #6, "Accelerated Training Record." The sequence of events to be followed after an examination failure is outlined in Attachment #1 or #2 page 6 of 8. The operator is required to pass a second written examination prior to resuming licensed duties.

Individuals receiving a grade of less than 80% in any particular area of the annual examination shall be required to attend lectures on that subject during the upcoming year's lecture series. The procedure to be followed to determine required lecture attendance is illustrated in Attachment #1 or #2 page 1 of 8 and is described in the "Lecture Series" of this administrative training procedure.

Program Schedule

The requalification program schedule is as described in "Program Description" and as illustrated in Figure #1.

The Training Coordinator has the authority to modify the normal requalification training schedule as special circumstances arise. The Training Coordinator will keep the Plant Manager informed of all changes in the program schedule.

Program Responsibility

Responsibilities for Operator Requalification Training are summarized below:

Training Coordinator

The Training Coordinator is responsible for:

1. Implementing the Licensed Operator Requalification Training Program.
2. Preparing and grading the annual simulated NRC written examination.
3. Utilizing the results of the annual written exam, determining required lecture attendance for the upcoming lecture series.
4. Preparing any required accelerated training programs.
5. Determining the content of each lecture topic.
6. Setting all requalification training lecture dates.
7. Developing or approving a lesson plan for each requalification lecture.
8. Assigning qualified lecturers for requalification lectures.
9. Approving quizzes that may be given in conjunction with the requalification training lecture series.
10. Preparing, administering and grading any required quiz retakes.
11. Periodically reviewing plant control manipulation records in the control room.
12. Preparing assignments for and documenting completion of the on-shift review program.
13. Scheduling the annual oral examination at the end of each requalification year and assigning examiners.
14. Modifying the normal requalification training schedules as necessary due to special circumstances.
15. Maintaining all licensed operator requalification program documentation as specified in "Program Documentation."
16. Making applications for operator license renewals based upon successful participation in the requalification training program.



Individual Training Records

The following requalification training program documentation will be maintained in each individual's training record. If desired, for ease of documentation, the current Licensed Operator Requalification Summary for each licensed operator may be maintained in one common file.

<u>DOCUMENTATION</u>	<u>RETENTION PERIOD</u>
Attachment #1 Licensed Operator Requalification Summary Part I	Life of Facility
Attachment #2 Licensed Operator Requalification Summary Part II	Life of Facility
Attachment #3 Operating and Oral Examination Summary Report	2 years after program completion
Attachment #4 Record of Plant Control Manipulations	2 years after program completion
Attachment #5 Shift Review Form	2 years after program completion
Attachment #6 Accelerated Training Record (if required)	2 years after program completion
Attachment #7 Requalification Program Summary Completion	2 years after program completion

General Requalification Program Files

The following requalification training program documentation will be maintained in general files:

Annual Written Examination and Answer Key	2 years after program completion
Copies of Lecture Series Quizzes and Answer Key	2 years after program completion
Attachment #8, Change Review Record	2 years after program completion
Attachment #9, Class Roster	2 years after program completion

LICENSED OPERATOR REQUALIFICATION SUMMARY PART I

NAME _____

Training Cycle Dates: June 19__ - May 19__

LICENSE TYPE: _____

LICENSE NUMBER: _____

DATE ISSUED: _____

REQUALIFICATION PROGRAM - YEAR _____

- A. Determine required lecture attendance based on the results of the annual written examination administered at the conclusion of the previous requalification year.

DATE ADMINISTERED: _____

<u>Required For</u>	<u>Lecture Topics</u>	<u>X= Areas of Re- quired Atten- dance</u>
< 80, Section 1,6	1 Theory & Principles of Operations	_____
< 80, Section 1,6	2 General & Specific Operating Characteristics	_____
< 80, Section 4,8	3 Plant Instrumentation & Control	_____
< 80, Section 4,5,9	4 Radiation Control & Safety	_____
< 80, Section 3,8	5 Plant Protection Systems	_____
< 80, Section 3,8,10	6 Engineered Safety Systems/ Technical Specifications	_____
< 80, Section 3,8,9	7 Features of Facility Design	_____
< 80, Section 5,9	8 Normal, Abnormal & Emergency Procedures	_____
< 80, Section 2,7	9 Fluid Flow, Thermodynamics and Heat Transfer	_____

TRAINING COORDINATOR

B. LECTURE ATTENDANCE SUMMARY - Record Individual Requalification
Lecture Exam Results

1. THEORY AND PRINCIPLES OF OPERATION

<u>SPECIFIC LECTURE TITLE</u>	QUIZ <u>GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	
Quiz Retake Grade (if necessary)	_____	_____	

2. GENERAL AND SPECIFIC OPERATING CHARACTERISTICS

<u>SPECIFIC LECTURE TITLE</u>	QUIZ <u>GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	
Quiz Retake Grade (if necessary)	_____	_____	

3. PLANT INSTRUMENTATION AND CONTROL

<u>SPECIFIC LECTURE TITLE</u>	QUIZ <u>GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	
Quiz Retake Grade (if necessary)	_____	_____	

B. LECTURE ATTENDANCE SUMMARY

4. RADIATION CONTROL AND SAFETY

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

5. PLANT PROTECTION SYSTEMS

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

6. ENGINEERED SAFETY SYSTEMS/TECHNICAL SPECIFICATIONS

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

B. LECTURE ATTENDANCE SUMMARY

7. FEATURES OF FACILITY DESIGN

<u>SPECIFIC LECTURE TITLE</u>	QUIZ <u>GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

8. NORMAL, ABNORMAL, AND EMERGENCY PROCEDURE REVIEW

<u>SPECIFIC LECTURE TITLE</u>	QUIZ <u>GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

9. THERMODYNAMICS, FLUID FLOW, AND HEAT TRANSFER

<u>SPECIFIC LECTURE TITLE</u>	QUIZ <u>GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

C. ANNUAL WRITTEN EXAMINATION SUMMARY

Date Taken _____

<u>RO</u>	<u>GRADE</u>	<u>MAKEUP</u>
1. Principles of Nuclear Power Plant Operation	_____	_____
2. Fundamentals of Thermodynamics, Heat Transfer and Fluid Flow	_____	_____
3. Plant Design, Including Safety & Emergency Systems	_____	_____
4. Instruments and Controls	_____	_____
5. Procedures - Normal, Abnormal, Emergency and Radiological Control	_____	_____

OVERALL

<u>SRO</u>	<u>GRADE</u>	<u>MAKEUP</u>
6. Theory of Nuclear Power Plant Operations	_____	_____
7. Theory of Fluids and Thermodynamics	_____	_____
8. Plant Systems: Design, Control & Instrumentation	_____	_____
9. Procedures - Normal, Abnormal, Emergency and Radiological Control	_____	_____
10. Administrative Procedures, Conditions and Limitations	_____	_____

OVERALL

D. 1. Annual Written Exam Overall Grade Less Than 80% or Any Category Less Than 70%.

a. Individual removed from licensed duties

DATE REMOVED

SIGNATURE, PLANT MANAGER

b. Accelerating training program assigned (Attachment #6)

DATE ASSIGNED

SIGNATURE, TRAINING COORDINATOR

c. Accelerated training program completed

DATE COMPLETED

SIGNATURE, TRAINING COORDINATOR

d. Makeup exam passed

MAKEUP GRADE

SIGNATURE, TRAINING COORDINATOR

e. Individual returned to licensed duties

DATE RETURNED

SIGNATURE, PLANT MANAGER

2. Annual Written Exam Grade Greater Than or Equal to 80%.

Determine lecture attendance requirements for the upcoming lecture series and document on Attachment #2 Part A.

E. Annual Oral Examination Summary

1. Attachment #3 Complete and Satisfactory.

DATE

SIGNATURE, EXAMINER

2. Unsatisfactory Results

- a. Accelerated training program assigned.

DATE

SIGNATURE, TRAINING COORDINATOR

- b. Accelerated training program completed.

DATE

SIGNATURE, TRAINING COORDINATOR

- c. Oral re-examination completed.

DATE

SIGNATURE, EXAMINER

F. PLANT CONTROL MANIPULATION SUMMARY

Manipulation record reviewed and filed (Attachment 4).

Simulator Training completed on _____
DATE_____
DATE REVIEWED_____
TRAINING COORDINATORG. ON-SHIFT REVIEW SUMMARYPERIODIC ASSIGNMENT COMPLETEDDATE COMPLETED INITIAL

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

TRAINING COORDINATOR



LICENSED OPERATOR REQUALIFICATION SUMMARY PART II

NAME _____

Training Cycle Dates: June 19__ - May 19__

LICENSE TYPE: _____

LICENSE NUMBER: _____

DATE ISSUED: _____

REQUALIFICATION PROGRAM - YEAR _____

- A. Determine required lecture attendance based on the results of the annual written examination administered at the conclusion of the previous requalification year.

DATE ADMINISTERED: _____

<u>Required For</u>	<u>Lecture Topics</u>	<u>X= Areas of Re-quired Atten-dance</u>
< 80, Section 1,6	1 Theory & Principles of Operations	_____
< 80, Section 1,6	2 General & Specific Operating Characteristics	_____
< 80, Section 4,8	3 Plant Instrumentation & Control	_____
< 80, Section 4,5,9	4 Radiation Control & Safety	_____
< 80, Section 3,8	5 Plant Protection Systems	_____
< 80, Section 3,8,10	6 Engineered Safety Systems/ Technical Specifications	_____
< 80, Section 3,8,9	7 Features of Facility Design	_____
< 80, Section 5,9	8 Normal, Abnormal & Emergency Procedures	_____
< 80, Section 2,7	9 Fluid Flow, Thermodynamics and Heat Transfer	_____

TRAINING COORDINATOR

B. LECTURE ATTENDANCE SUMMARY - Record Individual Requalification Lecture Exam Results

1. THEORY AND PRINCIPLES OF OPERATION

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

2. GENERAL & SPECIFIC OPERATING CHARACTERISTICS

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

3. PLANT INSTRUMENTATION AND CONTROL

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

B. LECTURE ATTENDANCE SUMMARY

4. RADIATION CONTROL AND SAFETY

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	
Quiz Retake Grade (if necessary)	_____	_____	

5. PLANT PROTECTION SYSTEMS

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	
Quiz Retake Grade (if necessary)	_____	_____	

6. ENGINEERED SAFETY SYSTEMS/TECHNICAL SPECIFICATIONS

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	
Quiz Retake Grade (if necessary)	_____	_____	

3

B. LECTURE ATTENDANCE SUMMARY

7. FEATURES OF FACILITY DESIGN

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

8. NORMAL, ABNORMAL AND EMERGENCY PROCEDURES

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

9. FLUID FLOW, THERMODYNAMICS, AND HEAT TRANSFER

<u>SPECIFIC LECTURE TITLE</u>	<u>QUIZ GRADE</u>	<u>DATE</u>	<u>LENGTH</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Average Quiz Grade	_____	_____	_____
Quiz Retake Grade (if necessary)	_____	_____	_____

C. ANNUAL WRITTEN EXAMINATION SUMMARY

Date Taken _____

R0GRADEMAKEUP

1. Principles of Nuclear Power Plant Operation
2. Fundamentals of Thermodynamics, Heat Transfer and Fluid Flow
3. Plant Design, Including Safety & Emergency Systems
4. Instruments and Controls
5. Procedures - Normal, Abnormal, Emergency and Radiological Control

OVERALL

SROGRADEMAKEUP

6. Theory of Nuclear Power Plant Operations
7. Theory of Fluids and Thermodynamics
8. Plant Systems: Design, Control & Instrumentation
9. Procedures - Normal, Abnormal, Emergency and Radiological Control
10. Administrative Procedures, Conditions and Limitations

OVERALL



D. 1. Annual Written Exam Overall Grade Less Than 80% or Any Category Less Than 70%.

a. Individual removed from licensed duties

DATE REMOVED

SIGNATURE, PLANT MANAGER

b. Accelerating training program assigned (Attachment #6)

DATE ASSIGNED

SIGNATURE, TRAINING COORDINATOR

c. Accelerated training program completed

DATE COMPLETED

SIGNATURE, TRAINING COORDINATOR

d. Makeup exam passed

MAKEUP GRADE

SIGNATURE, TRAINING COORDINATOR

e. Individual returned to licensed duties

DATE RETURNED

SIGNATURE, PLANT MANAGER

2. Annual Written Exam Grade Greater Than or Equal to 80%.

Determine lecture attendance requirements for the upcoming lecture series and document on the upcoming Requalification Year's Attachment #1 Part A.



E. Annual Oral Examination Summary

1. Attachment #3 Complete and Satisfactory.

DATE

SIGNATURE, EXAMINER

2. Unsatisfactory Results

- a. Accelerated training program assigned.

DATE

SIGNATURE, TRAINING COORDINATOR

- b. Accelerated training program completed.

DATE

SIGNATURE, TRAINING COORDINATOR

- c. Oral re-examination completed.

DATE

SIGNATURE, EXAMINER

F. PLANT CONTROL MANIPULATION SUMMARY

Manipulation record reviewed and filed (Attachment 4).

Simulator Training completed on _____
DATE_____
DATE REVIEWED_____
TRAINING COORDINATORG. ON-SHIFT REVIEW SUMMARYPERIODIC ASSIGNMENT COMPLETEDDATE COMPLETEDINITIAL

1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____
11.	_____	_____
12.	_____	_____

TRAINING COORDINATOR

OPERATING AND ORAL EXAMINATION SUMMARY REPORT

LICENSE TYPE SRO _____ RO _____

LICENSEE _____

REQUALIFICATION YEAR _____

SIGNATUREDATE

1. KNOWLEDGE OF LATEST REVISION OF:

a. Facility Design Changes _____

b. Changes in Procedures _____

c. Facility License Changes _____

2. DISCUSS CONTENTS OF:

a. Abnormal Procedures (list procedures reviewed)

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

b. Emergency Procedures (list procedures reviewed)

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

3. PLANT WALKTHROUGH:

SIGNATUREDATE

a. System and Components Discussed

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

b. Evolutions Discussed

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

c. Evolutions Performed

_____	_____	_____
_____	_____	_____
_____	_____	_____



SIGNATUREDATE

3. PLANT WALKTHROUGH: (Continued)

d. Procedures Discussed or Performed

e. Miscellaneous (Reactor Theory, Technical Specifications,
Radiation Protection, Emergency Plan)

SIGNATUREDATE

3. PLANT WALKTHROUGH

e. Miscellaneous (Continued)

_____	_____	_____
_____	_____	_____
_____	_____	_____

f. Person Giving Oral Examination

NAME _____ DATE _____

JOB TITLE _____ ORAL EXAM GRADE _____

g. Comments on Examination



D. C. COOK NUCLEAR PLANT
OPERATOR REQUALIFICATION PROGRAM

NAME: _____

LICENSE: RO/SRO _____

JOB TITLE: _____

RECORD OF PLANT CONTROL MANIPULATIONS

<u>ACTIVITY</u>	<u>DATE</u>	<u>SUPERVISOR'S INITIALS</u>
*1. Plant or reactor startups to include a range that reactivity feedback from nuclear heat addition is noticeable and heatup rate is established.	_____ _____ _____	_____ _____ _____
2. Plant shutdown.	_____ _____ _____	_____ _____ _____
*3. Manual control of steam generators and/or feedwater during startup or shutdown.	_____ _____ _____	_____ _____ _____
4. Boration and/or dilution during power operation.	_____ _____ _____	_____ _____ _____
*5. Any significant (greater than 10%) power changes in manual rod control.	_____ _____ _____	_____ _____ _____
*6. Loss of coolant, including:		
1) Significant steam generator leaks.		
2) Inside and outside primary containment.		
3) Large and small, including leak-rate determination		
4) Saturated reactor coolant response.	_____ _____ _____	_____ _____ _____
7. Loss of electrical power (and/or degraded power sources).	_____ _____ _____	_____ _____ _____
*8. Loss of core coolant flow/natural circulation.	_____ _____ _____	_____ _____ _____
9. Loss of condenser vacuum.	_____ _____	_____ _____



<u>ACTIVITY</u>	<u>DATE</u>	<u>SUPERVISOR'S INITIALS</u>
10. Loss of essential service water.	_____	_____
	_____	_____
	_____	_____
11. Loss of shutdown cooling.	_____	_____
	_____	_____
	_____	_____
12. Loss of component cooling system or cooling to an individual component.	_____	_____
	_____	_____
	_____	_____
13. Loss of normal feedwater or normal feedwater system failure.	_____	_____
	_____	_____
	_____	_____
*14. Loss of all feedwater (normal and emergency).	_____	_____
	_____	_____
	_____	_____
15. Loss of protective system channel.	_____	_____
	_____	_____
	_____	_____
16. Mispositioned control rod(s) (or rod drops).	_____	_____
	_____	_____
	_____	_____
17. Inability to drive control rods.	_____	_____
	_____	_____
	_____	_____
18. Conditions requiring use of emergency boration.	_____	_____
	_____	_____
	_____	_____
19. Fuel cladding failure or high activity in reactor coolant or offgas.	_____	_____
	_____	_____
	_____	_____
20. Turbine or generator trip.	_____	_____
	_____	_____
	_____	_____
21. Malfunctions of automatic control system(s) which affect reactivity.	_____	_____
	_____	_____
	_____	_____



<u>ACTIVITY</u>	<u>DATE</u>	<u>SUPERVISOR'S INITIALS</u>
22. Malfunction of reactor coolant pressure/volume control system.	_____ _____ _____	_____ _____ _____
23. Reactor trip.	_____ _____ _____	_____ _____ _____
24. Main steam line break (inside or outside of containment).	_____ _____ _____	_____ _____ _____
25. Nuclear instrumentation failure(s).	_____ _____ _____	_____ _____ _____

*Required at least annually.



SHIFT REVIEW FORM

TO: LICENSEE:

SHIFT TRAINING FOR REQUALIFICATION TRAINING PERIOD :

PLEASE REVIEW THE FOLLOWING ASSIGNMENTS:

I HAVE COMPLETED THE ABOVE ASSIGNED REVIEW BY 1) PARTICIPATION
IN A GROUP SHIFT SESSION _____, OR 2) INDIVIDUAL STUDY. _____.

LICENSEE SIGNATURE

DATE



ACCELERATED TRAINING RECORD

NAME _____ TITLE _____ DATE ASSIGNED _____

A. Reason for accelerated review:

1. () Annual Written Exam Failure Grade _____ Date Taken _____
2. () Annual Oral Exam Unsatisfactory Date Taken _____
3. () Other _____ Date Taken _____

B. Review Assignment:C. Recommendation for Re-Exam:

Accelerated training program certified complete:

SIGNATURE, LICENSED OPERATOR_____
DATE_____
SIGNATURE, TRAINING COORDINATOR_____
DATED. Makeup Examination Results:

1. () Written Examination Grade _____ Date _____
2. () Oral Examination Sat _____ Unsat _____ Date _____
3. () Other _____ Sat _____ Unsat _____ Date _____

REQUALIFICATION PROGRAM SUMMARY COMPLETION

A. Annual Written Examination Results:

Year_____ Grade_____ T.C. Initial_____
Year_____ Grade_____ T.C. Initial_____

B. Plant Control Manipulations Reviewed:

Year_____ T.C. Initial_____
Year_____ T.C. Initial_____

C. Oral Examination Complete:

Year_____ T.C. Initial_____
Year_____ T.C. Initial_____

REQUALIFICATION PROGRAM CERTIFIED COMPLETE:

TRAINING COORDINATOR

DATE

NO. _____

INDIANA & MICHIGAN ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

CHANGE REVIEW RECORD

I. DATE _____

II. TYPE OF CHANGE:

___ DESIGN CHANGE ___ PROCEDURAL CHANGE ___ LICENSE CHANGE

___ NRC DOCUMENT ___ LICENSE EVENT REPORT ___ NOTEPAD

___ OTHER _____

III. ATTACHMENTS:

V. REQUIRED TRAINING:

___ FORMAL TRAINING LECTURE ___ INDIVIDUAL REVIEW ___ SHIFT GROUP DISC.

TRAINING COORDINATOR

(Signature of Reviewer/Shift Supervisor)



CLASS ROSTER

INSTRUCTOR _____

DATE _____

COURSE TITLE _____

FROM _____ TO _____

MATERIAL COVEREDNAME (Please Print)

1. _____	21. _____
2. _____	22. _____
3. _____	23. _____
4. _____	24. _____
5. _____	25. _____
6. _____	26. _____
7. _____	27. _____
8. _____	28. _____
9. _____	29. _____
10. _____	30. _____
11. _____	31. _____
12. _____	32. _____
13. _____	33. _____
14. _____	34. _____
15. _____	35. _____
16. _____	36. _____
17. _____	37. _____
18. _____	38. _____
39. _____	40. _____



D. C. COOK NUCLEAR PLANT
TRAINING PROGRAMS
REVIEW AND APPROVAL SHEET

OPERATOR REPLACEMENT TRAINING
(Program Name)

DATE PREPARED OR
REVISED: _____

May 18, 1982

PREPARED BY: _____

William A. Nichols

REVIEWED BY: (Applicable
Dept. Head Minimum)

David Miller 5/18/82
Signature Date

[Signature] 5/18/82
Signature Date

[Signature] 5/18/82
Signature Date

[Signature] 5/20/82
Signature Date

Signature Date

APPROVED: _____

Plant Manager

W. A. Smith

5/22/82
Date



OPERATOR REPLACEMENT TRAINING PROGRAM

The Operator Replacement Training Program supplies selected operating personnel with the background and experience necessary for safe and reliable operation of the plant controls and prepares them for the NRC Reactor Operator licensing examinations.

Prior to selection to the program, the license candidates shall have been working in the control room under the direction of qualified licensed operators. All control room instructions, including control manipulations, shall be documented in form OHI-2070 Attachment 5 (attached) until the trainee is licensed by the NRC.

Formal classroom instruction will be given in the areas and subjects listed in the Non-licensed Operator Training Program as necessary to ensure thorough trainee comprehension. In addition, formal classroom instruction will be given in the following subjects:

A. Neutron Behavior

1. Microscopic Cross Section.
2. Neutron Energy vs Cross Section.
3. Doppler Broadening.
4. Macroscopic Cross Section.
5. Neutron Density.
6. Neutron Flux.



7. Reaction Rate Calculation.
8. Energy Dependence of Reaction Rate.
9. Neutron Reactions.
 - a. Control Materials.
 - b. Water.
 - c. Density Effects.
 - d. Structural Materials.
10. Power and Power Density.
11. Neutron Scattering.
12. Moderator Properties.
 - a. Slowing Down Power.
 - b. Moderating Ratio.
 - c. Non-Nuclear Factors.
13. Neutron Density Energy Spectrum.
14. Neutron Flux Energy Spectrum.
15. Neutron Diffusion.
16. Neutron Reflection.

B. Reactor Theory

1. Neutron Balance Equations.
2. Multiplication Factors.
3. The Neutron Cycle.
4. Fast Neutrons.
5. Epithermal Neutrons.
6. Neutron Leakage.
7. Thermal Absorption - Fuel.

8. Fast Fission.
9. Epithermal Resonance Capture.
10. Thermal Absorption - Not Fuel.
11. Neutron Cycle Calculations.
12. Calculating the Reproduction Factor.
13. The Fast Fission Factor.
14. The Resonance Escape Probability.
15. Calculating the Thermal Utilization Factor.
16. The Four Factor Formula - The Infinite Multiplication Factor.
17. Enrichment Effects on the Four Factors.
18. Poison Effects on the Four Factors.
19. Moderator-to-Fuel Ratio Effects on the Four Factors.
20. Core Life Effects on the Four Factors.
21. Thermal Neutron Leakage Calculations.
22. Fast Neutron Leakage Calculations.
23. Moderator-to-Fuel Ratio Effects on Leakage.
24. Enrichment Effects on Leakage.
25. Poison Effects on Leakage.
26. Core Life Effects on Leakage.
27. The Six Factor Formula -.The Effective Multiplication Factor.
28. Neutron Flux Distribution.
29. Neutron Reflection.
30. Core Zoning.
31. Power-Flux Relationship.
32. Power Distribution.
33. Peaking Factors.
34. Radial Nuclear Factor.



35. Axial Nuclear Factor.
36. Local Nuclear Factor.
37. Total Nuclear Factor.
38. Neutron Production.
39. Prompt Neutrons.
40. Delayed Neutrons.
41. Delayed Neutron Emissions.
42. The Delayed Neutron Fraction.
43. The Delayed Neutron Fraction over Core Life.
44. The Effective Delayed Neutron Fraction.
45. Neutron Lifetime and Generation Time.
46. Delayed Neutron Effects.
47. Reactivity.
48. Reactor Period.
49. The Power Law.
50. Startup Rate.
51. Doubling Time.
52. The Inhour Equation.
53. Reactor Control System Effects.
 - a. Short-Term.
 - b. Intermediate-Term.
 - c. Long-Term.
54. Typical Absorber Materials.
55. Effect of Control Poisons on the Effective Multiplication Factor.
56. Control Poison Forms.
57. Black and Gray Poisons.

58. Effects of Control Systems on Flux Shape.
 - a. Control Rods.
 - b. Soluble Poison.
 - c. Burnable Poisons.
59. Differential Rod Worth.
60. Integral Rod Worth.
61. Differential Boron Worth.
62. The Doppler Coefficient.
63. The Moderator Temperature Coefficient.
64. Undermoderation.
65. Overmoderation.
66. The Pressure Coefficient.
67. The Void Coefficient.
68. The Isothermal Moderator Temperature Coefficient.
69. The Power Coefficient.
70. Calculations of Reactivity Changes.
71. Variations in the Doppler Coefficient.
72. Variations in the Moderator Temperature Coefficient.
 - a. Effect of Fuel Temperature Changes.
 - b. Effect of Changes in Moderator Density.
 - c. Effect of Poison Density.
 - d. Effect of Core Age.
73. Reactivity Defects.
74. The Power Defect.
75. Neutron Competition and Shadowing.
76. Conditions Affecting Control Rod Worth.
77. Coefficients and Control and a Pressurized Water Reactor.



78. Fission Product Formation.
79. Xenon Production and Removal.
80. Equilibrium Xenon.
81. Startup Xenon Transients.
82. Shutdown Xenon Transients.
83. Restart Xenon Transients.
84. Power Change Xenon Transients.
85. Xenon Oscillations.
86. Equilibrium Samarium.
87. Samarium Transients.
88. Core Reactivity Requirements - Excess Reactivity.
89. Core Nuclear Reactions.
90. Fuel Depletion Effects on Reactivity.
 - a. U-235 Burnout.
 - b. Fission Product Poison Buildup.
 - c. Pu-239 Buildup.
 - d. Burnable Poisons Depletion.
 - e. Total Core Life Effect.
 - f. Refueling.
91. Other Fuel Depletion Effects.
 - a. Effects on Flux.
 - b. Effects on the Six Factors.
 - c. Effects on the Effective Delayed Neutron Fraction.
 - d. Effects on the Reactivity Coefficients.
92. Neutron Sources.
93. 1/M Plots.
94. Fuel Loading.



95. The Approach to the Critical Condition.
96. Predictions of Criticality.
97. Physics Testing.
 - a. Rod Worth Measurement.
 - b. Coefficient Worth Measurement.
 - c. Reactivity Follow.
98. Power Changes.
99. End of Core Life.
100. Reactor Coastdown.
101. Turbine Runback.
102. Planned Shutdown.
103. Reactor Trip.
104. Shutdown Cooling Requirements.
105. Fuel Management.
106. Refueling.

To enhance the theory phase of instruction, the trainees will participate in a training program at a research reactor. During this program they will perform experiments to exhibit and measure reactivity effects. The trainees will gain hands-on experience by performing startups and shutdowns of the reactor.

Plant systems will be taught in depth through formal classroom instruction and in-plant study. Normal, Abnormal, and Emergency Operating Procedures will be emphasized. Controls, instrumentation, setpoints, automatic actions, differences between the Units, system interfaces, and Technical Specifications limitations will be stressed.



During systems training, the use of installed equipment and systems to control or mitigate accidents in which the core is severely damaged will be taught. The systems covered are:

1. Reactor Core.
2. Reactor Coolant System.
3. Pressurizer and Pressure Relief System.
4. Rod Control System.
5. Chemical and Volume Control System.
6. Residual Heat Removal System.
7. Excore Nuclear Instrumentation System.
8. Incore Nuclear Instrumentation System.
9. Reactor Protection System.
10. Emergency Core Cooling System.
11. Containment System.
12. Ice Condenser System.
13. Containment Spray and Hydrogen Recombiner System.
14. Fuel Handling System.
15. Primary Sampling System.
16. Component Cooling Water System.
17. Essential Service Water System.
18. Non-Essential Service Water System.
19. Demineralized Water System.
20. Spent Fuel Pit Systems.
21. Waste Disposal Vent and Drain System.
22. Liquid Waste Disposal System.
23. Gaseous Waste Disposal System.
24. Solid Waste Disposal System.



25. Containment Ventilation System.
26. Auxiliary Building Ventilation System.
27. Control Room Ventilation System.
28. Emergency Diesel Generator System.
29. Auxiliary Feedwater System.
30. Compressed Air System.
31. Lube Oil Cleanup System.
32. Secondary Sampling System.
33. Secondary Chemical Feed Systems.
34. Primary Water System.
35. Primary Gas System.
36. Water Fire Protection System.
37. Carbon Dioxide and Halon Fire Protection System.
38. Miscellaneous Fire Protection Systems.
39. Plant Computer.
40. Radiation Monitoring System.
41. Portable Radiation Instruments.
42. Steam Generator and Steam Generator Blowdown System.
43. Main Steam System.
44. Auxiliary Steam System.
45. Plant Heating Boiler.
46. Main Turbine and Control System.
47. Steam Seal Supply and Exhaust System.
48. Main Turbine Lube Oil System.
49. Bleed Steam System.
50. Moisture Separator/Reheater and Feedwater Heater Drains.
51. Circulating Water System.

52. Chlorination System.
53. Miscellaneous Sealing and Cooling Water System.
54. Vacuum Priming System.
55. Condensate System.
56. Feedwater System.
57. Steam Generator Level Control System.
58. Steam Dump System.
59. Main Generator and Auxiliary Systems.
60. 4160V Electrical Distribution.
61. 600V AC Electrical Distribution.
62. 120V AC Electrical Distribution.
63. 250V DC Electrical Distribution.

The trainees will be instructed in the Plant Technical Specifications Safety Limits, Limiting Safety System Settings, Limiting Conditions for Operation and Bases for these limits. They will be held responsible for knowing all Action Statements of one hour or less.

Further intensive training in Instrumentation and Control Systems, Radiation Control and Protection, and Thermodynamics will be given.

Periodic written and oral examinations will be given throughout the program to evaluate trainee performance and to prepare them for taking the NRC written and oral examinations.



Plant operating characteristics and responses to transients will be taught. Accident diagnosis and corrective actions will be emphasized.

Each trainee will be assigned to Operations for three months to work as an extra person on-shift prior to taking the license examination. The purpose of this assignment is to familiarize the trainee with control room operations and with daily control room activities.

The trainees will attend a simulator training program where they will perform plant evolutions and casualties. An NRC approved simulator certification program will be utilized for the demonstration portion of the Reactor Operator licensing examination at this time.

Simulated NRC written and oral examinations will be administered to the license candidates to audit their preparation for the NRC Reactor Operator licensing examinations. This audit will be an input in determining which candidates will be recommended for the NRC examination and will be used to identify weak areas needing further study.

After the audit examination, a minimum two week review series will be conducted in final preparation for the NRC examination. Weak areas and overall plant operation will be stressed.



No. of Hours _____
(to the nearest 1/10 hour)
Date _____
Shift _____

REACTIVITY MANIPULATION

Control Board Time _____

To be completed by Hot License candidates (Replacement Reactor Operator Students) working under instruction in the Control Room, or by any individual Auxiliary Equipment Operator that is working under instruction in the Control Room.

Name - Print

Signature

Control Manipulations, Oral Exams (Walkthrough), etc.

Be Specific:

Name - Print (RO, SRO)

Signature

Forward immediately to the Training Department each and every time a student works in the Control Room.

D. C. COOK NUCLEAR PLANT
TRAINING PROGRAMS
REVIEW AND APPROVAL SHEET

NON-LICENSED OPERATOR TRAINING
(Program Name)

DATE PREPARED OR REVISED: June 30, 1981.

PREPARED BY: Pamela A. Croy

REVIEWED BY: (Applicable
Department Head Minimum)

David D. Nelson 7-6-81
Training Coordinator Date

C. E. Murphy 7-27-81
Date

BA Swanson 8/3/81
Date

Date

Date

APPROVED: D. J. Challa 8/7/81
Plant Manager Date



NON-LICENSED OPERATOR TRAINING PROGRAM

The Non-Licensed Operator Training Program prepares new operators for the assumption of Auxiliary Equipment Operator duties in the plant. The program provides Operations Department indoctrination and instruction in plant processes, systems, and operations. Individual check-out, formal classroom instruction, and on-shift training by qualified personnel are utilized. The formal classroom instruction will consist of three phases.

Phase A will include classroom instruction in mechanical descriptions of major plant components, brief descriptions of basic theoretical and mathematical concepts, exposure to a few plant systems, and discussions on plant instructions and procedures.

Phase B will include more in-depth discussion of the theory behind the operation of the plant components and systems. Major topics include: Thermodynamics, Basic Electricity, Radiation Protection, Plant Chemistry, and background mathematics.

In Phase C selected plant systems will be taught, utilizing formal classroom instruction and in-plant study. Systems operated by non-licensed personnel will be taught in-depth from an operational standpoint. Operating procedures will be emphasized. There will also be a classroom instruction on basic plant instrumentation and controls with emphasis on those related to systems which are taught or have been previously covered. Periodic written examinations will be given throughout the program to evaluate trainee performance and program effectiveness.

Instructions in the following procedures, instructions, topics, and systems will be given in the designated phases:

PHASE A

I. Procedures and Instructions

- A. Operations Department Head Instructions and Procedures: Review OHI-2010 requirements for procedure adherence, methods and reasons to change procedures.
- B. Containment Integrity and Access: PMI-2100.
- C. Equipment Control, Clearance Permit System: PMP-2110 CPS.001.
- D. Bypass of Safety Functions: OHI-2140.
- E. Oral Communications Affecting Plant Activities: OHI-2150.
- F. Use of Approved Chemicals and Cleaning Agents: OHI-2160.
- G. Maintenance of Operations Department Logs: OHI-2211.
- H. Rework Clearance Permit System: OHI-2220.
- I. Reporting of Spills (Non-Radioactive): OHI-2230.
- J. Fire Protection and Safety Equipment: OHI-2270.
- K. Fire Prevention, Control of Ignition Sources: OHI-2275.
- L. Job Orders: OHI-2290.
- M. Standing Orders: OHI-2300, all Plant Manager Standing Orders and Operations Department Standing Orders.
- N. Plant Operations Policy: OHI-4010.
- O. Condition Reports: PMP-7030 RPT.001.
- P. Special Instructions: OHI-2260.
- Q. Control of Combustible Material: PMI-2271.

II. Overview of Nuclear Power

- A. Electrical Power Production.
- B. Introduction to Nuclear Power Plants.
- C. Reactor components:
 - 1. Fuel.
 - 2. Coolant.
 - 3. Moderator.

4. Control Material.

D. Reactor Types.

1. BWR.

2. PWR.

3. Other types.

E. Plant Licensing.

F. Operator Licensing.

G. Fuel Loading.

III. Mathematics

A. Review of Basic Algebra.

B. Mathematical Notation.

C. Scientific Notation.

D. Dimensional Analysis.

E. Ratio and Proportion.

F. Problem-Solving Techniques.

IV. Physics

A. Definition of Physics.

B. The Scientific Method.

C. Combined Fundamental Units.

D. Linear Motion.

E. Atomic Structure.

1. Electrons.

2. Protons.

3. Neutrons.

F. Chart of the Nuclides.

G. Abundance and Enrichment.

H. Newton's Laws.



- J. Wave Propagation.
- K. Work.
- L. Energy.
- M. Power.
- N. Temperature.
- O. Pressure.
- P. Volume.
- Q. Universal Gas Law.

V. Plant Performance

- A. Flow Diagrams.
 - 1. Symbols and Terminology.
 - 2. Uses.
- B. Basic Steam Cycle.
- C. The Turbine Cycle.
- D. Types of Turbines.
 - 1. Impulse Turbine.
 - 2. Reaction Turbine.
- E. Condensers.
- F. Heat Exchangers.
- G. Valves and Pumps (Mechanical Aspects).
 - 1. Valve Components.
 - a. Seat.
 - b. Disk.
 - c. Stem.
 - d. Packing.
 - 2. Valve Types and Their Uses.
 - a. Gate.

- b. Globe.
- c. Butterfly.
- d. Diaphragm.
- e. Check.
- f. Needle.
- 3. Valve Actuators.
 - a. Manual Types.
 - b. Air Operators.
 - c. Motor Operators.
 - d. Hydraulic Operators.
 - e. Failure Modes.
- 4. Vacuum Pumps.
- 5. Positive Displacement Pumps.
- 6. Eductors and Jet Pumps.
- 7. Centrifugal Pumps.
 - a. Radial Flow.
 - b. Axial Flow.
 - c. Mixed Flow.
 - d. Multistage.
 - e. Performance Curves.
 - f. Methods of Sealing.

VI. Basic Electricity

- A. Charges.
- B. Electrical Fields.
- C. Coulomb's Law.
- D. Electric Potential.
- E. Magnetism.
- F. Conductors.

- G. Insulators.
- H. Resistors.
- I. Ohm's Law.
- J. AC and DC Power.

VII. Chemistry

- A. Chemical Reactions.
- B. Ion Exchangers.
- C. Balancing simple chemical reactions.

VIII. Radiation Protection

- A. ALARA.
- B. Personnel Dosimetry.
 - 1. Ion Chambers.
 - 2. Film Badges.
 - 3. Self-Reading Dosimeters.
 - 4. Thermoluminescent Dosimeter.
- C. Protective Clothing: Donning and Removing.
- D. Decontamination.
 - 1. Personnel.
 - 2. Equipment.
 - 3. Area.
- E. Respiratory Protection.
 - 1. Protection Factors.
 - 2. Air-Purifying Respirators.
 - 3. Air-Line Respirators.
 - 4. Self-Contained Breathing Apparatus.

IX. Systems Overview Primary

- A. Reactor Coolant System (RCS).
- B. Pressurizer and pressurizer relief.
- C. Rod Control.
- D. Chemical and Volume Control System (CVCS).
- E. Residual Heat Removal (RHR).
- F. Reactor Protection.
- G. Containment.

X. Systems Overview Secondary

- A. Steam Generating.
- B. Turbine.
- C. Condenser.
- D. Generator.
- E. Electrical Distribution.

XI. Makeup Plant (Demineralizer) System

XII. Fire Protection Systems

- A. CO₂.
- B. Halon.
- C. Water.

PHASE B

A. Math

1. Exponents and Logarithms (Natural and Common).
2. Graphic Presentation.
 - a. Slope (Derivative).
 - b. Area under a Curve (Integral).
3. Interpolation.
4. Extrapolation.
5. Statistics.
6. Probability.
7. Basic Trigonometry.
 - a. Pathagerom's Thereom.
 - b. Trigonometry Functions: Sine, Cosine, Tangent.
 - c. Sine Wave.

B. Thermodynamics and Plant Performance

- 1.* Basic Steam Cycle.
- 2.* Temperature.
- 3.* Pressure.
- 4.* Volume.
- 5.* Universal Gas Law.
6. Heat.
7. Enthalpy.
8. Entropy.
9. Cycle Diagrams.
10. Steam Tables and Mollier Diagram.
11. First Law of Thermodynamics.
12. Potential Energy.

*Brief review of topic.

13. Kinetic Energy.
14. Internal Energy.
15. Fluid Flow.
16. Force of Friction.
17. Flow Work.
18. Mechanical Work.
19. Use of Bernoulli's Equation.
20. Energy Conversion.
21. The Second Law of Thermodynamics and Efficiency!
22. Heat Transfer.
 - a. Conduction.
 - b. Convection.
 - c. Radiation.
23. Heat Transfer Parameters.
 - a. Temperature Difference.
 - b. Area.
 - c. Material.
 - d. Flow.
24. Boiling Heat Transfer and Effects of:
 - a. Pressure.
 - b. Temperature.
 - c. Flow.
25. Steam Boiler Characteristics.
26. Reactor Thermal Performance.
 - a. Reactor Heat Transfer.
 - b. Nucleate Boiling.
 - c. Departure from Nucleate Boiling.
 - d. Film Boiling.
 - e. Critical Heat Flux.



- 27.* The Turbine Cycle.
- 28. Critical Pressure Ratio.
- 29. Orifices.
- 30.* Types of Turbines.
 - a. Impulse Turbine.
 - b. Reaction Turbine.
- 31. The Superheat Cycle.
- 32. The Reheat Cycle.
- 33. Condenser Theory and Cycle Efficiency.
- 34. Condensate Depression.
- 35. Condenser Design.
- 36. Condenser Fouling.
- 37. Condenser Air Binding.
- 38. Condenser Air Leakage.
- 39. Turbine Extration and Feedwater Heating.
- 40. Hydraulic Systems.
- 41. Pump Theory.
 - a.**Positive Displacement Pumps.
 - b.**Eductors and Jet Pumps.
 - c.**Centrifugal Pumps.
 - 1) Radial Flow.
 - 2) Axial Flow.
 - 3) Mixed Flow.
 - 4) Multistage.
 - 5) Performance Curves.
 - 6) Methods of Sealing.
 - d. Net Positive Suction Head.
 - e. Total Dynamic Head.
- 42. Steam Cycle Efficiency.
- 43. Heat Balances - Calorimetrics.

*Brief review of topic, **Theory of Operation.

C. Plant System Related to Thermodynamics

1. Bleed Steam and Heater Drains, or
2. Steam Generation.

D. Electricity

1. Electrical Circuits.
2. Kirchoff's Law.
3. Electrical Measurement.
 - a. Galvanometer.
 - b. Ammeter.
 - c. Voltmeter.
 - d. Ohmmeter.
 - e. Wheatstone Bridge.
 - f. Vacuum Tube Voltmeter.
 - g. Electrometer.
4. Laws of Motors.
5. Laws of Generators.
6. Inductors.
7. Capacitors, Diodes.
8. AC Terminology.
9. AC Circuit Components.
10. Power in AC Circuits.
11. AC Generators.
12. DC Generators.
13. Transformers.
14. AC Electrical Measurement.
15. Relays.
16. Breakers.
17. Limit Switches.

18. Motor Control Centers.

19. Reading Elementaries.

E. Electrical Plant System

1. 4160 Volt Distribution, or

2. Main Generator.

F. Nuclear Physics I

1. Radioactivity.

2. Radiation.

a. Alpha.

b. Beta.

c. Gamma.

d. Neutron.

3. Decay Chains.

4. Interactions of Radiation with Matter.

5. Ranges of Radiation in Matter.

6. Basic Shielding.

7. Shielding Calculations.

8. Activity.

9. Specific Activity.

10. Half-Life.

G. Radiation Protection

1.* ALARA.

2. Cellular Damage.

3. Whole Body Dose: Acute and Chronic.

4. Effects of Contamination.

5. Exposure and Dose Units.

6. Activity Units.

7. Modifying Units.

8. Radiation Limits and Guides.



9. Contamination Limits.
10. Maximum Permissible Concentrations (MPC).
11. Time, Distance, Shielding.
12. Dose Calculations.
13. Contamination Control.
 - a. Design Features.
 - b. Plant Procedures.
 - c. Common Sense Rules.
- 14.* Respiratory Protection.
 - a. Protection Factors.
 - b. Air-Purifying Respirators.
 - c. Air-Line Respirators.
 - c. Self-Contained Breathing Apparatus.
- 15.* Protective Clothing: Donning and Removing.
16. Radiation Detection.
 - a. Basic Circuit.
 - b. Six-Region Curve.
 - c. Detector Types and Characteristics.
17. Scintillation Detectors.
18. Semiconductor Detection Systems.
19. Neutron Detection.
- 20.* Personnel Dosimetry.
 - a. Ion Chambers.
 - b. Film Badges.
 - c. Self-Reading Dosimeters.
 - d. Thermoluminescent Dosimeter.
21. Physical Discrimination.
22. Electronic Discrimination.

23. Surveys.
 - a. Radiation.
 - b. Contamination.
 - c. Airborne Contamination.
24. Portable Radiation Monitors.
25. Area Radiation Monitors.
26. Continuous Air Monitors.
27. Gaseous Process Monitors.
28. Liquid Process Monitors.
29. Ge-Li Detector.
- 30.* Decontamination.
 - a. Personnel.
 - b. Equipment.
 - c. Area.
31. Radioactive Waste.
 - a. Sources.
 - b. Processing.
 - c. Handling.
32. Radioactive Releases.
33. Atmospheric Dispersion Calculations.
34. Siting Criteria.
35. Environmental Surveillance.
36. Emergency Planning.
37. Protective Action Guides.

H. Plant Chemistry

1. Purposes of Chemical Control.
2. General Corrosion.
3. Crud.

*Brief review of topic.



4. Oxygen Control.
5. Hydrogen Control.
6. pH Control.
7. Temperature Effects.
8. Corrosion Inhibitors.
9. Chloride Stress Corrosion.
10. Caustic Embrittlement.
11. Galvanic Corrosion.
12. Crevice Corrosion.
13. Pitting Corrosion.
14. Radiation Chemistry.
15. Radiolytic Decomposition and Recombination of Water.
16. Nitrogen Reactions.
17. Deposition of Solids.
18. Activation of Corrosion Products.
19. Other Activation Products.
20. Fission Product Control.
21. Reactor Coolant System Chemistry Limits and the
Bases for these Limits.
22. Decontamination Factors.
23. Dissolved Gas Control.
24. Chemical Additions.

I. Plant Primary and Secondary Sampling Systems



PHASE C

A. Overview of Technical Specifications

1. Purpose and Origins.
2. Categories of Limits.
3. Contents of the Technical Specifications.
4. Definitions.
5. Safety Limits.
6. Limiting Safety System Settings.
7. Limiting Conditions for Operation.
8. Surveillance Requirements.
9. Design Features.
10. Administrative Controls.
11. Environmental Technical Specifications.
12. Violations.

B. Instrumentation and Control Systems

1. Passive Functions.
2. Active Functions.
3. Protective Functions.
4. Pressure Detection.
 - a. Bourdon Tube.
 - b. Diaphragm Gauge.
 - c. Bellows Gauge.
5. Level Detection.
 - a. Gauge Glass.
 - b. Float Gauge.
 - c. Differential Pressure Gauge.



6. Flow Detection.
 - a. Rotometer.
 - b. Manometer.
 - c. Differential Pressure Cell.
 - d. Orifice.
 - e. Venturi.
 - f. Elbow.
7. Temperature Detection.
 - a. Liquid-Filled Thermometers.
 - b. Dial Thermometer.
 - c. Filled Thermal System.
 - d. Bi-Metallic Thermostat.
 - e. Resistance Temperature Detector.
 - f. Thermocouple.
8. Signal Transmission.
 - a. Mechanical.
 - b. Pneumatic.
 - c. Electrical.
9. Digital Signals.
10. Analog Signals.
11. Recorders.
12. Control Loops.
13. Set Points.
14. Deadband.
15. Proportional Control.
16. Reset Control.
17. Rate Control.
18. Manual Control.
19. Automatic Control.



20. Bumpless Transfer.
21. Switches and Logic Concepts.
22. Bistables.
23. Transducers.

C. Plant Systems

1. Reactor Core.
2. Reactor Coolant System.
3. Electrical Distribution - AC and DC.
4. Emergency Diesel Generator.
5. Waste Disposal System - Liquid and Gaseous.
6. Demineralized Makeup Water System.
7. Chemical and Volume Control System.
8. Main Steam and Steam Generating.
9. Auxiliary Steam and Plant Heating Boiler.
10. Gland Seal and Exhaust Systems.
11. Main Turbines and Auxiliary Systems.
12. Main Generators and Auxiliary Systems.
13. Main Feed Systems.
14. Auxiliary Feed Systems.
15. Condensate Systems.
16. Circulating Water Systems.
17. Essential Service Water Systems.
18. Compressed Air Systems.
19. Fire Protection Water, Carbon Dioxide and Halon.
20. Blowdown and Blowdown Treatment Systems.
21. Ice Condenser and Refrigeration System.
22. Emergency Core Cooling System.
23. Control Room Ventilation System.



24. Non-Essential Service Water Systems.
25. Component Cooling Water Systems.
26. Spent Fuel Pit (includes cooling and cleanup).

Between Phase A and B and between Phase B and C of classroom instruction, the new operators will spend time in the plant on-shift as on-the-job trainees (Utility Operators). During on-shift training, the new operator will complete portions of OHI-2070, Attachment #2 and #3. Portions of OHI-2070, Attachment #3 may be covered in formal classroom sessions. Further development of job proficiency will be accomplished through continuous on-the-job training. As qualification is demonstrated, it will be documented on OHI-2070, Attachment #3. Upon successful completion of these prerequisites, the Utility Operator will be evaluated for promotion to Auxiliary Equipment Operator. OHI-2070, Attachment #3 must be successfully completed prior to such promotion.



NON-LICENSED OPERATOR TRAINING

The following instructions and procedures contain important information. The SOE/OE/Training Coordinator shall, to his satisfaction, see that they are read and/or discussed with each new employee to the extent applicable to the new employee's duties.

1. Operations Department Head Instructions and Procedures. Review OHI-2010, requirements for procedure adherence, methods, and reasons to change procedures.
2. Containment integrity and access. Review PMI-2100.
3. Equipment Control Clearance Permit System. Review PMP-2110 CPS.001.
4. Bypass of Safety Functions. Review OHI-2140.
5. Oral Communications Affecting Plant Activities. Review OHI-2150.
6. Use of Approved Chemicals and Cleaning Agents. Review OHI-2160.
7. Maintenance of Operations Department Logs. Review OHI-2211.
8. Rework Clearance Permit System. Review OHI-2220.
9. Reporting of Spills (Non-Radioactive). Review OHI-2230.
10. Fire Protection and Safety Equipment. Review OHI-2270.
11. Fire Prevention Control of Ignition Sources. Review OHI-2275.
12. Job Orders. Review OHI-2290.
13. Standing Orders. Review OHI-2300, all PMSO's and OSO's.
14. Plant Operations Policy. Review OHI-4010.
15. Condition Reports, PMP-7030 RPT.001.
16. Special Instructions. Review OHI-2260, Special Instructions
17. Control of Combustible Material. Review PMI-2271.

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

I have reviewed and understand the
above instructions.

Employee Signature

Date

SOE/Training Coordinator Signature



NON-LICENSED OPERATOR CHECK-OFF SHEET

NAME _____

ITEM	*OBSERVED BY - DATE	**APPROVED BY - DATE (SUPERVISOR)
Start up the Heating Boiler		
Shutdown the Heating Boiler		
Regenerate a Demineralizer Water Bed		
Liquid Waste Release (At Least Two [2])	1.	
	2.	
	3.	
	4.	
Waste Gas Release		
Start up Boric Acid Evaporator		
***Shutdown Boric Acid Evaporator		
Start up Waste Evaporator		
***Shutdown Waste Evaporator		
Clearance Permit (At Least Two [2])	1.	
	2.	
	3.	

*The person that signs Observed By shall be present when the trainee performs the requirement.

**Approved By signifies the trainee is qualified to perform the evolution.
The person that signs "Approved By" shall be a Supervisor.

***Cooldown and Pump Out is acceptable.



AUXILIARY EQUIPMENT OPERATOR TRAINING

NAME _____

DATE STARTED _____

DATE COMPLETED _____

VERIFIED COMPLETED _____

SOE

SPECIAL PRECAUTIONS IN OPERATION OF EQUIPMENT (INSTRUCTOR: DISCUSS IN MORE DETAIL)

<u>Precautions</u>	<u>Instructor Initials*</u>
1. Warming and pressurizing cold steam line - Consider: Temps, Drainage, Water Hammer, Venting, Source Supply, Leaks, Instrumentation.	_____
2. Pressurizing empty vessel or line - Consider: Press, Temp, Venting, Leaks, Instrumentation.	_____
3. Draining tanks or piping - Consider: Venting, Drain Path	_____
4. Any pump, before it is started and during the running period must have at least a minimum flow through it to prevent it from burning up. The person giving the OK to run the pump is responsible for insuring proper valving and minimum flow.	_____
5. Opening drain valves. Sometimes the valve can be plugged and the plug can break loose suddenly, releasing hot steam or water. Be careful of this.	_____
6. Be aware of CO ₂ fire equipment in closed rooms; be familiar with the isolation procedure.	_____
7. Never change any valve position unless you know for sure what you are going to affect. (ASK QUESTIONS).	_____
8. Do not stand close to motors when they are starting.	_____
9. Do not accept responsibility to do a job unless you feel capable of doing that job.	_____
10. Hazards of H ₂ , CO ₂ , N ₂ .	_____
11. Hazards of Acid and Caustic.	_____
12. Steam Leaks and Hazards.	_____
13. Idle equipment can be started at any time without notice. Be aware of this.	_____
14. Hazards and proper valving of chlorine.	_____
15. Use of issued safety equipment - hard hat, flashlight, ear plugs and gloves.	_____
16. Uses and abuses of valve persuaders; how and when to use.	_____
17. Operation of:	
a) Turbine Room Sump	_____
b) Screen Wash System and Basket Cleaning	_____

*EO/Unit Supervisor/OE/SOE



The SOE/OE shall assure that the operator has demonstrated sufficient knowledge of the location and function of equipment, can identify normal and abnormal operating indications, and make the required checks and readings to satisfactorily complete each tour section as detailed in OHP 4030.001.001.

ATTACHMENT #1 COMPLETED

SOE/OE/TC

Date

OUTSIDE PLANT TOUR

SOE/OE

Date

ATTACHMENT #2 COMPLETED

SOE/OE

Date

TURBINE BUILDING TOUR

SOE/OE

Date

AUXILIARY BUILDING TOUR

SOE/OE

Date

UTILITY EQUIPMENT OPERATOR
TRAINING COMPLETED

SOE/OE/TC

Date

SAT UNSAT
(Circle One)

UTILITY OPERATOR ELIGIBLE
FOR PROMOTION TO AUXILIARY
EQUIPMENT OPERATOR

SOE/OE

Date

RECOMMENDED FOR PROMOTION TO
AUXILIARY EQUIPMENT OPERATOR

SOE/OE

Date



SCHEDULE-A-MONTH

UD TRAINING PHASE "A"

JULY - 1981

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		30	1 0800 at Admin Bldg	2	3 **HOLIDAY**	4
5	6 NGET (Brown or Davidson) RESPIRATORY	7 READING (Brown) OHI's (Brown)	8 (Davidson) WHOLE BODY COUNT: FACE MASK OHI DISCUSSION (Brown)	9 NET-1-1 (Davidson) NET-1-2 (Davidson)	10 NET-1-3 (Davidson) VISITOR CENTER TOUR 1:30 pm	11
12	13 MATH I (Croy) FLOW DIAGRAMS (Brown)	14 MATH II (Croy) STEAM GENERATORS, TURBINE CONDENSER, HEAT EXCHANGER (Brown)	15 INTRO-PHYSICS (Croy) STUDY	16 ATOM (Croy) PUMPS, VALVES, AND ACTUATORS (Brown)	17 STUDY EXAM	18
19	20 ELECTROSTATICS (Davidson) LINEAR & WAVE MOTION NEWTON'S LAW (Croy)	21 MAGNETISM (Davidson) WORK, ENERGY, POWER GAS LAW (Croy)	22 OHM'S LAW (Davidson) STUDY	23 AC & DC POWER (Davidson) CHEMISTRY (Brown)	24 STUDY EXAM	25
26	27 RP (Brown or Davidson) RP (Brown or Davidson)	28 RESPIRATORY (Brown or Davidson) SYSTEM OVERVIEW PRIMARY	29 (Croy) SYSTEM OVER- VIEW SECONDARY MUP (Croy)	30 (Jenkins) FIRE PROTECTION CO ₂ HALON WATER IN PLANT TOUR	31 STUDY EXAM	

SCHEDULE-A-MONTH

PHASE "B"

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
WEEK 1	EXPONENTS LOGS THERMO I	GRAPHS THERMO II	STATISTICS PROBABILITY STUDY	BASIC TRIG THERMO III	STUDY EXAM	
WEEK 2	THERMO IV ELECTRICITY I	THERMO V ELECTRICITY II	THERMO VI STUDY	THERMO VII ELECTRICITY III	STUDY EXAM	
WEEK 3	HOLIDAY HOLIDAY	THERMO SYSTEM ELECTRICITY IV	NUCLEAR PHYSIC-I STUDY	RP I ELECTRICITY V	STUDY EXAM	
WEEK 4	RP II ELECTRICITY VI	RELAYS, BREAK- ERS, LIMIT SWITCHES RP III	ELECTRICAL SYSTEMS STUDY	MCC ELEMENTARIES RP IV	STUDY EXAM	
WEEK 5	RP V CHEMISTRY I	RP VI CHEMISTRY II	RP VII STUDY	CHEMISTRY III PRIMARY AND SECON- DARY SAMPLING	STUDY EXAM	

REFERENCES AND TIME ALLOCATIONS
FOR NON-LICENSED OPERATOR TRAINING PROGRAM

The following is an outline of the major topics for the Utility Operator Training Program which follows the Training Program description. References are limited to the texts and books stored in the Training Department's audiovisual aids rooms ("H" rooms). The class times indicated are those used in past classes for the major topics covered. This is to be used as a guide only.

ONE CLASS PERIOD EQUALS 4 HOURS CLASSROOM INSTRUCTION

PHASE "A"

I. Procedures and Instructions

- A. Time:
 - 1. Two class periods for reading.
 - 2. One class period for discussion.
- B. References (OHI-2070 Attachment #1):
 - 1. OHI-2010, PMI-2100, PMP-2110 CPS.001.
 - 2. OHI-2140, OHI-2150, OHI-2160, OHI-2211.
 - 3. OHI-2220, OHI-2230, OHI-2270.
 - 4. OHI-2275, OHI-2290, OHI-2300, OHI-4010.
 - 5. PMP-7030 RPT.001, OHI-2260, PMI-2271.

II. Overview of Nuclear Power

- A. Time: 3 class periods.
- B. References:
 - 1. NET 1-1 through NET 1-3.
 - 2. Nuclear Power Plant Steam and Mechanical Fundamentals, Sections 1 and 2.



III. Mathematics

A. Time: 2 class periods.

B. References:

1. Basic Technical Mathematics with Calculus.
2. NET 2-1.
3. Academic Program for Nuclear Power Plant Personnel, Volume 1, Mathematics.

IV. Physics

A. Time: 4 class periods.

B. References:

1. Academic Program for Nuclear Power Plant Personnel, Volume II, Physics.
2. NET 2-5.
3. Nuclear Power Plant Steam and Mechanical Fundamentals, Sections 3, 4, 5, and 6.

V. Plant Performance

A. Time: 3 class periods.

B. References:

1. Nuclear Power Plant Steam and Mechanical Fundamentals, Sections 15, 16, 17, 18, 19, 21, 22, and 29.
2. Academic Program for Nuclear Power Plant Personnel, Volume III.
3. NET 4..
4. NET 7-7.

VI. Basic Electricity

A. Time: 4 class periods.

B. References:

1. Electricity One and Seven.
2. Training Files on Electricity.

3. Academic Program for Nuclear Power Plant Personnel, Volume IV, Chapter 3.

VII. Chemistry

A. Time: 1 class period.

B. References:

1. Academic Program for Nuclear Power Plant Personnel, Volume IV, Chapter 1.
2. Nuclear Power Plant Steam and Mechanical Fundamentals, Section 20.

VIII. Radiation Protection

A. Time: 3 class periods.

B. References:

1. Academic Program for Nuclear Power Plant Personnel, Volume IV, Chapter 2.
2. NET 5.
3. Nuclear Power Plant Steam and Mechanical Fundamentals, Sections 7, 27, and 28.

IX. Systems Overview Primary

A. Time: 1 class period.

B. References:

1. Nuclear Systems Volumes I and II, Cook Training Articles.
2. Nuclear Power Plant Steam and Mechanical Fundamentals, Sections 13 and 14.

X. Systems Overview

A. Time: 1 class period.

B. References:

1. Power Generation Systems Volumes I and II, Cook Training Articles.
2. Nuclear Power Plant Steam and Mechanical Fundamentals, Section 12.



XI. Makeup Plant (Demineralizer) System

A. Time: 1 class period.

B. References:

1. Auxiliary System 4, "Demineralized Water", Cook Training Articles.
2. D. C. Cook Nuclear System Description, DCC-CH103, Makeup Water System.

XII. Fire Protection Systems

A. Time: 1 class period.

B. References:

1. Auxiliary System 17, "Water Fire Protection", Cook Training Articles.
2. Auxiliary System 18, "Carbon Dioxide Fire Protection", Cook Training Articles.
3. Auxiliary System 19, "Miscellaneous Fire Protection", Cook Training Articles.

PHASE "B"

A. Math

1. Time: 4 class periods.

2. References:

- a. Basic Technical Mathematics with Calculus.
- b. NET 2-2 through NET 2-4.
- c. Academic Program for Nuclear Power Plant Personnel, Volume 1, Mathematics.

B. Thermodynamics

1. Time: 7 class periods.

2. References:

- a. Academic Program for Nuclear Power Plant Personnel, Volume III.



b. NET 4.

C. Plant System Related to Thermodynamics

1. Time: 1 class period.
2. References:
 - a. D. C. Cook Training Articles.

D. Electricity

1. Time: 6 class periods.
2. References:
 - a. Electricity One and Seven.
 - b. Training Files on Electricity.
 - c. Academic Program for Nuclear Power Plant Personnel, Volume IV, Chapter 3.

E. Electrical Plant System

1. Time: 1 class period.
2. References:
 - a. D. C. Cook Training Articles.

F. Nuclear Physics

1. Time: 1 class period.
2. References:
 - a. NET 2-7 and NET 2-8.
 - b. Academic Program for Nuclear Power Plant Personnel, Volume II.
 - c. Nuclear Power Plant Steam and Mechanical Fundamentals, Sections 6, 7, and 8.

G. Radiation Protection

1. Time: 7 class periods.



2. References:

- a. Academic Program for Nuclear Power Plant Personnel, Volume IV, Chapter 2.
- b. NET 5.

H. Plant Chemistry

1. Time: 3 class periods.

2. References:

- a. Academic Program for Nuclear Power Plant Personnel, Volume IV, Chapter 1.
- b. NET 6-1 through 6-5.

I. Plant Primary and Secondary Sampling Systems

1. Time: 1 class period.

2. References:

- a. D. C. Cook Training Articles.

PHASE "C"

A. Overview of Technical Specifications

1. Time: 2 class periods.

2. References:

- a. D. C. Cook Nuclear Plant Unit 1 Technical Specifications, Appendices "A" and "B" to License No. DPR-58.
- b. D. C. Cook Nuclear Plant Unit 2 Technical Specifications, Appendices "A" and "B" to License No. DPR-74.

B. Instrumentation and Control Systems

1. Time: 2 class periods.

2. References:

- a. Training Files on Electricity.



- b. Academic Program for Nuclear Power Plant Personnel, Volume IV, Chapter 4.
- c. NET 7.
- d. Nuclear Power Plant Steam and Mechanical Fundamentals, Sections 24, 25, and 26.

C. Plant Systems

- 1. Time: Variable (Approximately one system per class period).
- 2. References:
 - a. D. C. Cook Plant Training Articles.



INDIANA & MICHIGAN
ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

Instruction or Procedure Temporary Sheet

<p>This temporary sheet applies to TRAINING Instruction or Procedure No. OHI-2070 Revision No. 2</p>	TEMPORARY SHEET NO. 3
<p>The following change (X) new requirement () shall be instituted effective (Date) <u>8-20-82</u>.</p> <p>Page 3 of 6 Change requirements for Shift Safety meetings from monthly to "each shift cycle"</p> <p>page 4 of 6 Under Non-Licensed Operator Training Add: Utility operator must take and pass the Auxiliary Equipment Operator promotion exam.</p> <p>Page 3 of 6 Change required system checkoffs from 34 to 43 systems under section C third paragraph.</p> <p style="text-align: right; margin-right: 100px;">OPERATIONS DEPARTMENT Controlled Copy No. <u>L</u></p> <p><i>Reason: Update training program to reflect additional requirements</i></p>	
<p>This change should be made a permanent revision to the Instruction or Procedure:</p> <p><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NOT KNOWN, additional review required</p>	
<p>Expiration Date: <u>Procedure Revision</u> Originator: <u>Daniel Hance</u> Management Staff: <u>THH</u> Senior Reactor Operator: <u>J. D. Anderson</u> PNSRC <u>Malin</u> Date <u>8/24/82</u> Plant Manager <u>Bilbrey</u> Date <u>8/24/82</u></p>	<p>Standard Dist. List No.: _____ Distribution: _____</p>



2

INDIANA & MICHIGAN
ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

Instruction or Procedure Temporary Sheet

<p>This temporary sheet applies to TRAINING</p> <p style="text-align: center;">Instruction or Procedure No. OHI-2070</p> <p style="text-align: center;">Revision No. 2</p>	<p>TEMPORARY SHEET NO.</p> <p>2</p>
<p>The following change (X) new requirement () shall be instituted effective (Date) <u>July 23, 1981</u></p> <p style="text-align: center; margin-top: 20px;">Change the following on Attachment #1</p> <div style="margin-left: 100px; margin-top: 20px;"><p>Item #1 OHI-2010 to PMI-2010</p><p>Item #6 OHI-2160 to PMI-2160</p><p>Item #10 OHI-2270 to PMI-2270</p><p>Item #11 OHI-2275 to PMI-2275</p><p>Item #13 Delete OHI-2300 change to "Review all PMSO's and OSO's.</p><p>Item #14 OHI-4010 to PMI-4010</p><p>Item #16 OHI 2260 to PMI-2260</p></div> <p style="text-align: center; margin-top: 40px;">The OHI's referenced have been cancelled and replaced by the corresponding PMI.</p>	
<p>This change should be made a permanent revision to the Instruction or Procedure:</p> <p><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NOT KNOWN, additional review required</p>	
<p>Expiration Date: <u>Procedure Revision</u></p> <p>Originator: <u>J. R. Sautland</u></p> <p>Management Staff: <u>Jim Mape</u></p> <p>Senior Reactor Operator: <u>David Campbell</u></p> <p>PNSRC <u>[Signature]</u> Date <u>7-22-81</u></p> <p>Plant Manager: <u>[Signature]</u> Date <u>7-22-81</u></p>	<p>Standard Dist. List No.: _____</p> <p>Distribution: _____</p> <p style="text-align: center; font-weight: bold; margin-top: 20px;">OPERATIONS DEPARTMENT</p> <p>Controlled Copy No. <u>9</u></p>



INDIANA & MICHIGAN
ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

Instruction or Procedure Temporary Sheet

<p>This temporary sheet applies to Training (AEO's) Instruction or Procedure No. OHI-2070 Revision No. 2</p>	<p>TEMPORARY SHEET NO. <u>X1</u> <i>cc</i></p>
<p>The following change () new requirement (X) shall be instituted effective (Date) <u>March 20, 1981</u></p> <p>Under Section "C" add third paragraph as follows:</p> <p style="padding-left: 40px;">The training required by the Auxiliary Equipment Operator will consist of partly "On The Job" training. This will be the study and understanding of the 34 systems addressed in the D. C. Cook Operator's Training Manual.</p> <p style="padding-left: 40px;">These systems "check off" must be completed prior to going into formal classroom training.</p> <p style="padding-left: 40px;">When the AEO is ready to checkout on one of the systems, he will contact a supervisor who will determine the AEO's knowledge level of that system by a written or oral examination.</p> <p style="padding-left: 40px;">The AEO's knowledge shall be documented on Attachment #6. This signed attachment and any written exam shall be forwarded to the Operations Supervisor. The Operations Supervisor will keep a record of the AEO's progress and forward all exams to the Training Department.</p> <p style="padding-left: 40px;">AEO Systems Checkoff (Attachment #6) is attached to this TP Sheet.</p> <p style="padding-left: 40px;">THIS WILL BE AN ADDITION TO THE PROCEDURE.</p>	
<p>This change should be made a permanent revision to the Instruction or Procedure:</p> <p><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NOT KNOWN, additional review required</p>	
<p>Expiration Date: <u>Procedure Revision</u> Originator: <u><i>David Campbell</i></u> Management Staff: <u><i>C. E. Murphy</i></u> Senior Reactor Operator: <u><i>C. E. Murphy</i></u> PNSRC <u><i>CC</i></u> Date <u><i>24 MAR 81</i></u> Plant Manager <u><i>CC</i></u> Date <u><i>24 MAR 81</i></u></p>	<p>Standard Dist. List No.: _____ Distribution: _____</p> <p style="text-align: center; font-weight: bold; font-size: 1.2em;">OPERATIONS DEPARTMENT</p> <p style="text-align: center;">Controlled Copy No. <u><i>9</i></u></p>

INDIANA & MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT

DEPARTMENT HEAD INSTRUCTION COVER SHEET

Instruction No. OHI-2070

Revision No. 2

TITLE TRAINING

SCOPE OF REVISION

Rev. 1 - Revised to incorporate requirements of PMI-2070, Revision 2. Major revisions required throughout, therefore, no marginal markings are entered.

Rev. 2 - Update Training Program with Existing Training Program.

OPERATIONS DEPARTMENT

Controlled Copy No. 9

SIGNATURES	Rev. 1	Rev. 2	Rev. 3	Rev. 4
PREPARED BY	<i>J. M. Randolph</i>	<i>J. A. S. S. S.</i>		
INTERFACING DEPARTMENT HEAD CONCURRENCE		<i>[Signature]</i>		
		NA		
		NA		
QUALITY ASSURANCE REVIEW	<i>[Signature]</i>	<i>[Signature]</i>		
DEPARTMENT HEAD APPROVAL	<i>[Signature]</i>	<i>[Signature]</i>		
PLANT NUCLEAR SAFETY COMMITTEE	<i>[Signature]</i>	<i>[Signature]</i>		
PLANT MANAGER APPROVAL	<i>[Signature]</i>	<i>[Signature]</i>		
DATE OF ISSUE	10-11-77	11-13-80		



INDIANA & MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT

DEPARTMENT HEAD INSTRUCTION COVER SHEET

Procedure No. OHI 2070

Revision No. 0

TITLE TRAINING

SCOPE OF REVISION

SIGNATURES	ORIGINAL	Rev. 1	Rev. 2	Rev. 3
PREPARED BY	<i>[Signature]</i>			
INTERFACING DEPARTMENT HEAD CONCURRENCE	<i>[Signature]</i>			
	NA			
	NA			
QUALITY ASSURANCE REVIEW	<i>[Signature]</i>			
DEPARTMENT HEAD APPROVAL	<i>[Signature]</i>			
PLANT NUCLEAR SAFETY COMMITTEE	<i>[Signature]</i>			
AEPSC NUCLEAR SAFETY & DESIGN REVIEW COMMITTEE	NA			
PLANT MANAGER APPROVAL	<i>[Signature]</i>			
DATE OF ISSUE	2-18-75			

LIST OF EFFECTIVE PAGES

<u>Page Number</u>	<u>Revision Number and Date</u>
Page 1 of 6	Revision 2 - 11/13/80
Page 2 of 6	Revision 2 - 11/13/80
Page 3 of 6	Revision 2 - 11/13/80
Page 4 of 6	Revision 2 - 11/13/80
Page 5 of 6	Revision 2 - 11/13/80
Page 6 of 6	Revision 2 - 11/13/80
Attachment #1 Page 1 of 1	Revision 2 - 11/13/80
Attachment #2 Page 1 of 1	Revision 2 - 11/13/80
Attachment #3 Page 1 of 3	Revision 2 - 11/13/80
Attachment #3 Page 2 of 3	Revision 2 - 11/13/80
Attachment #3 Page 3 of 3	Revision 2 - 11/13/80
Attachment #4 Page 1 of 1	Revision 2 - 11/13/80
Attachment #5 Page 1 of 1	Revision 2 - 11/13/80



INDIANA AND MICHIGAN POWER COMPANY
DONALD C. COOK NUCLEAR PLANT

Training

OBJECTIVE

To establish a training program for the Operations Department to ensure that all personnel develop and maintain job proficiency within their area of responsibility.

BACKGROUND

ANSI-N18.1 - 1971 Standard for Selection and Training of Personnel for Nuclear Power Plants and PMI-2070 require the establishment of a training program to initially develop and to maintain an organization fully qualified to be responsible for the operation, maintenance, and technical aspects of the plant. 10CFR55 requires that applicants for reactor operator and senior reactor operator licenses meet certain minimum requirements of training and experience.

DETAILS

The Operations Department training program has six primary functions: 1) Indoctrination, to familiarize new employees with the plant and applicable codes, standards, regulations and policy; 2) Non-licensed Operator Training, to familiarize the new employee with the plant and its policies through formal classroom training; 3) On-The-Job Training, to maintain familiarity with the above by individual study, group discussions and plant experience; 4) Operator Replacement Training, to prepare non-licensed operators for the NRC Reactor Operator examination; 5) Upgrade RO to SRO, to prepare the licensed operator for the NRC Senior Reactor Operator examination; and 6) Requalification Training, to maintain the proficiencies of the licensed operator per 10CFR55 Appendix A.

Indoctrination

All new employees assigned to the Operations Department shall receive training in each of the following areas.

- *1. Applicable Plant Manager Instructions
- *2. Quality Assurance Program Indoctrination
- *3. Radiation Protection/Health Physics
- *4. Industrial Health and Safety
- *5. Security Program and Procedures



- *6. Plant Emergency Plan and Implementing Procedure
- *7. Fire Fighting and Prevention
- 8. Applicable Operations Head Instructions
- 9. Applicable Operations Standing Orders
- 10. Applicable Plant Managers Orders, Instructions, and Procedures (Attach. #1)

Items preceded by an asterisk should normally be completed within the first two weeks of employment. If conditions prevent completion within the first two weeks of employment, the Operations Superintendent will establish the schedule for completion. This will be accomplished by the Training Department's General Employee Training Program. Each new employee will normally report to the Training Department for this training before being assigned to a shift. After shift assignment, the Shift Operating Engineer/ Operating Engineer will be responsible for ensuring the remaining indoctrination is completed and signed off on Attachment #1 to this instruction and forwarded to the Training Department for filing in the employee's training record folder. This training should be accomplished within 90 days after shift assignment.

Update training will be conducted in accordance with a schedule commensurate with pertinent interest and specific problem areas with the exception of Radiation Protection and Health Physics which shall be conducted twice yearly and the Emergency Plan which shall be conducted once a year.

Non-Licensed Operator Training

The Non-Licensed Operator Training Program prepares the new operator for the assumption of Utility Operator duties in the plant. The program provides Operations Department Indoctrination and instruction in plant process, systems, and operation. Individual check-out, formal classroom instruction, and on-shift training by qualified personnel are utilized.

The above training is accomplished by the Operations and Training Departments.

During the Non-Licensed Operator Training segment the trainee will complete Attachment #2.

On-The-Job Training

Continuous training will consist of a combination of special training sessions, classroom lectures, group discussions, individual study and review, as well as actual plant experience. The purpose of this training is to ensure all personnel develop and maintain job proficiency within their area of responsibility; keep abreast of current procedures, regulations and policy; and accomplish periodic



reviews in accordance with a schedule commensurate with policy, pertinent interest and the identification of specific problem areas.

This training will be accomplished through all, but is not limited to, the following:

A. Shift Safety Meetings

Shift Safety Meetings will be held monthly by each shift and attended by all members of the shift. A schedule shall be prepared on an annual basis of the required safety meeting topics and the person responsible for the instruction when they are known. The topics may include those requiring periodic review:

1. Emergency Plan and Procedure - Annually
2. Radiation Protection - Twice Annually
3. Industrial Safety - Semi-Annually
4. Clearance Permit System - Annually

Other topics will be included as needed. Accurate minutes of each meeting shall be recorded on Attachment #4.

B. Individual Review

Items of current importance that need to be brought to each operator's attention will be attached to review sheets and distributed for individual study and sign-off. Some examples of items that could be reviewed in this way are: changes to procedures; changes in facility license or design; and operating problems or abnormal occurrences at this or similar plants.

C. Special Training Sessions

Specific Fire Fighting Training will be conducted each calendar year. All Operations Department personnel will participate, when practical, in this training.

A program consisting of a series of standard Red Cross first aid training courses will be given each calendar year. PMI-2070 requires, as a minimum, all on-shift licensed operators maintain first aid certification. Additionally, other personnel will normally be offered this training as an option. Other special training sessions will be held as the need or opportunity arises. Approval and scheduling of attendance at special training will be through the Training Coordinator and the Operations Superintendent or Production Supervisor for Operations.



D. Non-Licensed Operator Training

The Non-Licensed Operator Training program provides the Utility Operator with the knowledge and skills necessary to be promoted to Auxiliary Equipment Operator.

Attachment #3 explains the requirements that must be met by the Utility Operator. This Attachment shall be completed before the Utility Operator is promoted to Auxiliary Equipment Operator. Upon completing Attachment #3 it should be forwarded to the Training Department to be filed in the trainee's training folder.

Operator Replacement Programs

This training program is designed to provide nuclear power plant operating personnel with training in: a) basic nuclear physics and reactor theory; b) radiation protection and plant chemistry; c) technical and practical knowledge required for reactor and plant operation; d) actual operating experience manipulating the reactor controls and related systems (Attachment 5); and e) operating experience associated with the turbine-generator and associated systems.

This training program supplies operating personnel with the necessary background and experience for safe and reliable operation of the plant and prepares them for the NRC Reactor Operator licensing examinations.

Upgrade Reactor Operator - Senior Reactor Operator License Training

This provides licensed Reactor Operators with training in limitations in the facility license, technical specifications, procedures, limitations involved in refueling, and procedures for handling and disposal of radioactive materials and effluents. This also supplies selected personnel with the necessary background and experience to direct the licensed activities of personnel assigned to them and prepares them for the NRC Senior Reactor Operator licensing examinations.

Licensed Operator Requalification Program

The licensed operator requalification program is designed to maintain a continuing high degree of knowledge and proficiency as required by 10CFR50 and 10CFR55, Appendix A. It will apply to all Operations Department personnel that are licensed operators or senior licensed operators.



The licensed operator requalification program will be conducted on a two-year cycle.

The requalification program shall consist of:

1. Formal classroom lectures
2. On-the-job training
3. An annual evaluation
4. Training documentation

Exams will be given throughout the various training programs. The results of these exams may determine the rate at which the employee will advance and if he is qualified to continue in his assigned duties.

The Training Coordinator shall maintain training records of all Operations Department personnel.

TEMPORARY EMPLOYEE TRAINING

Temporary employees whose only assignment will be in the office building and service building will receive the following training:

- A. Emergency Plan Training to the extent that they will recognize the sounding of the Nuclear Emergency Alarm and routes to follow to the office building basement area.
- B. Emergency reporting such that they will be prepared to report a fire or other emergency to the Shift Operating Engineer.
- C. Plant Security procedures applicable to the area they will be working in.

Temporary employees whose work requires access to all areas of the plant must receive the same general indoctrination training as permanent employees for the work to be accomplished.

RESPONSIBILITY

The Operations Superintendent is responsible for assuring that the Operations Department employees obtain the required training.



According to PMI-2070, the Training Department shall be directly responsible for developing and administering training programs for licensed and unlicensed operators. The Operations Superintendent shall assist in the development and administration of these programs. The training program shall be kept up to date to reflect plant modification and changes to procedures.

MANAGEMENT REVIEW

According to PMI-2070, the Plant Training Coordinator will annually review the Operations Department's training program and provide a written report to the Operations Superintendent and the Plant Manager of his findings and recommendations.

INTERFACES

The Administrative Supervisor is interfaced by this instruction since the Training Department is under his supervision.

DISTRIBUTION

In accordance with OHI-2010.

REPORTING

Training programs applicable to licensing, quality assurance, and nuclear safety shall be reviewed and approved by the Plant Manager, the Training Coordinator and the Operations Superintendent.

The Training Coordinator through testing programs shall establish a continuing audit of NRC licensed personnel and will provide a written report to the Plant Manager and Operations Superintendent on an annual basis.

SCHEDULE

The training programs required by this instruction shall be implemented within thirty days of this instruction.



NON-LICENSED OPERATOR TRAINING

The following instructions and procedures contain important information. The SOE/ OE/Training Coordinator shall, to his satisfaction, see that they are read and/or discussed with each new employee to the extent applicable to the new employee's duties.

1. Operations Department Head Instructions and Procedures. Review OHI-2010, requirements for procedure adherence, methods, and reasons to change procedures.
2. Containment integrity and access. Review PFI-2100.
3. Equipment Control Clearance Permit System. Review PMP-2110 CPS.001.
4. Bypass of Safety Functions. Review OHI-2140.
5. Oral Communications Affecting Plant Activities. Review OHI-2150.
6. Use of Approved Chemicals and Cleaning Agents. Review OHI-2160.
7. Maintenance of Operations Department Logs. Review OHI-2211.
8. Rework Clearance Permit System. Review OHI-2220.
9. Reporting of Spills (Non-Radioactive). Review OHI-2230.
10. Fire Protection and Safety Equipment. Review OHI-2270.
11. Fire Prevention Control of Ignition Sources. Review OHI-2275.
12. Job Orders. Review OHI-2290.
13. Standing Orders. Review OHI-2300, all PMSO's and OSO's.
14. Plant Operations Policy. Review OHI-4010.
15. Condition Reports, PMP-7030 RPT.001.
16. Special Instructions. Review OHI-2260, Special Instructions
17. Control of Combustible Material. Review PMI-2271.

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

Date

I have reviewed and understand the
above instructions.

Employee Signature

Date

SOE/Training Coordinator Signature



NON-LICENSED OPERATOR CHECK-OFF SHEET

NAME _____

ITEM	*OBSERVED BY - DATE	**APPROVED BY - DATE (SUPERVISOR)
Start up the Heating Boiler		
Shutdown the Heating Boiler		
Regenerate a Demineralizer Water Bed		
Liquid Waste Release (At Least Two [2])	1.	
	2.	
	3.	
	4.	
Waste Gas Release		
Start up Boric Acid Evaporator		
***Shutdown Boric Acid Evaporator		
Start up Waste Evaporator		
***Shutdown Waste Evaporator		
Clearance Permit (At Least Two [2])	1.	
	2.	
	3.	

*The person that signs Observed By shall be present when the trainee performs the requirement.

**Approved By signifies the trainee is qualified to perform the evolution.
The person that signs "Approved By" shall be a Supervisor.

***Cooldown and Pump Out is acceptable.



AUXILIARY EQUIPMENT OPERATOR TRAINING

NAME _____

DATE STARTED _____

DATE COMPLETED _____

VERIFIED COMPLETED _____ SOE



SPECIAL PRECAUTIONS IN OPERATION OF EQUIPMENT (INSTRUCTOR: DISCUSS IN MORE DETAIL)

<u>Precautions</u>	<u>Instructor Initials*</u>
1. Warming and pressurizing cold steam line - Consider: Temps, Drainage, Water Hammer, Venting, Source Supply, Leaks, Instrumentation.	_____
2. Pressurizing empty vessel or line - Consider: Press, Temp, Venting, Leaks, Instrumentation.	_____
3. Draining tanks or piping - Consider: Venting, Drain Path	_____
4. Any pump, before it is started and during the running period must have at least a minimum flow through it to prevent it from burning up. The person giving the OK to run the pump is responsible for insuring proper valving and minimum flow.	_____
5. Opening drain valves. Sometimes the valve can be plugged and the plug can break loose suddenly, releasing hot steam or water. Be careful of this.	_____
6. Be aware of CO ₂ fire equipment in closed rooms; be familiar with the isolation procedure.	_____
7. Never change any valve position unless you know for sure what you are going to affect. (ASK QUESTIONS).	_____
8. Do not stand close to motors when they are starting.	_____
9. Do not accept responsibility to do a job unless you feel capable of doing that job.	_____
10. Hazards of H ₂ , CO ₂ , N ₂ .	_____
11. Hazards of Acid and Caustic.	_____
12. Steam Leaks and Hazards.	_____
13. Idle equipment can be started at any time without notice. Be aware of this.	_____
14. Hazards and proper valving of chlorine.	_____
15. Use of issued safety equipment - hard hat, flashlight, ear plugs and gloves.	_____
16. Uses and abuses of valve persuaders; how and when to use.	_____
17. Operation of:	
a) Turbine Room Sump	_____
b) Screen Wash System and Basket Cleaning	_____

*EO/Unit Supervisor/OE/SOE



The SOE/OE shall assure that the operator has demonstrated sufficient knowledge of the location and function of equipment, can identify normal and abnormal operating indications, and make the required checks and readings to satisfactorily complete each tour section as detailed in OHP 4030.001.001.

ATTACHMENT #1 COMPLETED

SOE/OE/TC

Date

OUTSIDE PLANT TOUR

SOE/OE

Date

ATTACHMENT #2 COMPLETED

SOE/OE

Date

TURBINE BUILDING TOUR

SOE/OE

Date

AUXILIARY BUILDING TOUR

SOE/OE

Date

UTILITY EQUIPMENT OPERATOR
TRAINING COMPLETED

SOE/OE/TC

Date

SAT UNSAT
(Circle One)

UTILITY OPERATOR ELIGIBLE
FOR PROMOTION TO AUXILIARY
EQUIPMENT OPERATOR

SOE/OE

Date

RECOMMENDED FOR PROMOTION TO
AUXILIARY EQUIPMENT OPERATOR

SOE/OE

Date



OPERATIONS DEPARTMENT SAFETY MEETING

SHIFT _____

TIME STARTED _____

DATE MEETING HELD _____

TIME FINISHED _____

CHAIRMAN OF MEETING _____

MEMBERS PRESENT: _____

MEMBERS ABSENT:

DISCUSSION:

Name of Person Taking Minutes



No. of Hours _____
(to the nearest 1/10 hour)
Date _____
Shift _____

REACTIVITY MANIPULATION

Control Board Time

To be completed by Hot License candidates (Replacement Reactor Operator Students) working under instruction in the Control Room, or by any individual Auxiliary Equipment Operator that is working under instruction in the Control Room.

Name - Print

Signature

Control Manipulations, Oral Exams (Walkthrough), etc.

Be Specific:

Name - Print (RO,SRO)

Signature

Forward immediately to the Training Department each and every time a student works in the Control Room.



AEO SYSTEMS CHECKOFF

OHI 2070
Attachment #6

NAME _____ DATE _____

NAME OF SYSTEM _____

I have discussed the mentioned system with the above named individual.
I have given him oral or written quizzes. I feel that he has a good
basic understanding of the system.

SUPERVISOR _____

Forward all written quizzes to operations office for filing.

