Contract # DE-AC05-76ER04014
Report # ORO-4014-15

# ANNUAL PROGRESS REPORT OF THE UNIVERSITY OF FLORIDA TRAINING REACTOR

September 1, 1984 - August 31, 1985

By
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NUCLEAR FACILITIES DIVISION

**DEPARTMENT OF NUCLEAR ENGINEERING SCIENCES**

**College of Engineering**

**University of Florida**

**Gainesville**

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Submitted to the

Department of Energy
Nuclear Regulatory Commission

and

University of Florida

By

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Department of Nuclear Engineering Sciences
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Gainesville, Florida
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# I. INTRODUCTION

The University of Florida Training Reactor's overall utilization for the past reporting year has maintained the increase noted in the 1983-1984 reporting year as compared to previous years, continuing to exceed the levels of utilization characteristic of the early 1970's in some areas such as energy generation. The total energy generation (Kw-Hr) for this reporting year has decreased somewhat but is still at the third highest level ever and represents an increase of nearly 300% over the 1982-1983 reporting year which itself had an increase of 50% over the 1981-1982 reporting year. The maintenance of a high level of utilization during this reporting year is all the more noteworthy when several large forced outages are noted. First, all core outlet line thermocouples were replaced following failure of one thermocouple on September 25, 1984. This outage lasted for 14 days. The second major outage during the year followed the discovery on January 18, 1985 of a sticking control blade (Safety Blade #3) and its failure to drop and fully insert upon demand from the operating position. The maintenance and repair work associated with this failure involved a complete overhaul of all four (4) control blade drive systems external to the biological shield. The reactor was returned to operating status on March 7 following 39 days of unavailability. Despite these two major outages, each of which exceeded the total forced outages for any of the five previous reporting years, the UFTR was able to maintain previous high levels of usage in most areas without compromising safe operation of the facility.

An analysis of the facility utilization shows that the maintained usage and energy generation relative to the previous year is attributable to the same supporting conditions as last year. First, this reporting year is the second full year with complete installation of the new rabbit system and implementation of the associated Neutron Activation Analysis Laboratory (NAAL)

giving the staff the capability to promote it among University of Florida users and among researchers at other universities and colleges around the State of Florida. As its availability becomes better advertised, its usage continues to increase.

Second, this reporting year was only the second ever in which the University of Florida Training Reactor was supported as part of the Department of Energy's Reactor Sharing Program. This reactor sharing program is designed to increase the availability of University reactor facilities such as the UFTR to non-reactor owning colleges and universities (user institutions). Basically this grant provides funds against which reactor operating costs may be charged when the facilities are utilized by regionally affiliated user institutions for student instruction/training or for student or faculty research that is not supported by outside funding. In all, seven different academic institutions around the State of Florida made use of this program to utilize the UFTR for research, primarily via neutron activation analysis to determine trace element compositions, and for reactor facility demonstrations of various aspects of operation and training of students in various community college programs such as nuclear medicine technology and radiation protection technology. At years end, several unsupported research projects were still awaiting availability of the UFTR under the Reactor Sharing Program as UFTR usage attributable to this DOE-sponsored program continues to grow. Despite considerable cost-sharing by the University of Florida, all of the reactor sharing funds allocated by the Department of Energy for this supporting year were fully utilized. For this reason, an increase in Reactor Sharing Support is hoped for in the upcoming year.

Reactor use by University of Florida courses and laboratories continues at the substantial level established in the previous two years. Course and Department usages within the University range from the Environmental Engineering

Sciences Department in its graduate Health Physics laboratory to the Chemistry Department in a graduate level radiochemistry laboratory courses. Of course, the biggest single user department remains the Nuclear Engineering Sciences Department which uses the reactor facility for both graduate and undergraduate laboratories, research projects and class demonstrations.

The considerable test, maintenance and surveillance activities required by the facility license Technical Specifications or other controls also contributed significantly to usage. This contribution is larger than in most years because of several large maintenance and surveillance projects.

Finally, the acquisition of one three-week and one abbreviated three-day training program conducted for Florida Power Corporation (FPC) has rounded out significant contributions to facility utilization and total energy generation. Indications are that FPC is pleased with the UFTR staff and facilities and will continue periodic utilization of the facilities for training its operations staff.

With one training program already scheduled along with continued availability of the NAA laboratory and the remote sample-handling "rabbit" system plus renewal of the Reactor Sharing Program support, facility utilization and energy generation for the upcoming year should be maintained and possibly even considerably augmented. The latter augmentation is particularly possible because the UFTR utilizaton under the DOE Reactor Sharing Program has spread publicity on the availability of the UFTR so that a number of investigators on the University of Florida campus and elsewhere around the state have indicated an interest in using the reactor facility and the functional "rabbit" system during the upcoming year. Several other state wide users as an outgrowth of the DOE Reactor Sharing Program support, are in the process of preparing additional proposals hopefully to provide funded usage of the UFTR within the next two years. All of this provides reasonable expectation of continued growth of

reactor facility usge dependent on a continued upgrading of facility capabilities and staff expertise.

As noted in the 1983-1984 report, the facility administration was considerably stabilized by appointment of a fully vested Reactor Manager during that year. In combination with the return of the Director of Facilities, these conditions were all contributing to the considerable broad-based increases in facility usage for education and training of university students and utility operators as well as research by faculty at the University of Florida and other schools. The decision of some staff personnel to go on part-time employment at the end of the previous reporting year plus the facility director continuing to be on leave for the entire current reporting year has necessitated limitations in the growth of some usage programs since no full-time replacement personnel have yet been put in place. It is hoped that these limitations will be removed during the upcoming reporting year.

Several significant license-related administrative activities occurred during this reporting year. First, the completely revised and rewritten UFTR Emergency Plan following the guidelines of ANSI/ANS 15.16-1982 was submitted to NRC for final approval during the previous reporting year on October 14, 1983. Final approval of this Emergency Plan was received from NRC in a letter dated June 4, 1984 with a requirement for notification of full implementation of the Plan within 120 days*. Revision 1 updating and clarifying several pages of the Emergency Plan was submitted to the NRC in a letter dated June 25, 1984. Subsequently, during the current reporting year dated September 25, 1984, the NRC was notified that September 21, 1984, the day on which complete implementation of the UFTR Emergency Plan is considered to have occurred.

Second, as noted previously, the Director of Facilities has exercised his

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* Official notification of full implementation of the Plan was then transmitted to the NRC in a letter dated September 25, 1984.

option to continue his leave of absence for the upcoming year. However, the fully qualified Reactor Manager has been designated to act in his place while a fully qualified SRO has been designated as the Acting Reactor Manager. This administrative arrangement meets all regulatory requirements and has enabled the facility to meet all regulatory commitments while continuing to meet facility usage commitments. Third, a revised UFTR Operator Requalification and Recertification Program Plan was submitted in February, 1985 and has been approved for repetitive utilization at two year intervals in a letter received on July 18, 1985.

Finally, several major maintenance and surveillance efforts were undertaken during the year. The three major efforts involved over 50 days of administrative shutdown during the reporting year. The first major maintenance involved replacement of all primary coolant fuel box outlet thermocouples and thermocouple connections following failure of the thermocouple system on fuel box #4. This work necessitated an extended 14 day administrative shutdown. Similarly, the biennial fuel inspection of two fuel bundles in January necessitated another extended period of forced low power operation of three weeks primarily to allow cooling of the core. Finally, the failure of control blade safety #3 to drop from its normal operating position on demand involved over five weeks of administrative shutdown. During this time S-3 was restored to normal operation and preventive maintenance was performed on all four control blade drives to include all mechanisms external to the biological shielding. Although this maintenance was forced by the failure of a blade to drop, the work performed is all part of a required 5 year mechanical inspection of the reactor control blade system. Therefore, the work would have been performed in the next several years anyway. In general, the level of maintenance activity was much higher during this reporting year but it is expected that the efforts dedicated to maintenance should involve increased availablity in the next few

years.*

The UFTR continues to operate with an outstanding safety record and in full compliance with regulatory requirements. An NRC Security Inspection during the year resulted in only minor recommendations on clarifying an emergency response procedure and general security plan implementation. All recommendations have been fully implemented. An additional NRC Operations inspection during the year resulted in two deficiencies relative to lack of proper documentation of facility modifications and proper implementation of a quality assurance program as per ANSI Standard ANSI N402-1976, "Quality Assurance Program Requirements for Research Reactors." In the first case, the modification documentation was assembled and reviewed as per NRC commitment. For the second deficiency a commitment was made to NRC to develop a set of procedures to address quality assurance program requirements for Research Reactors as delineated in guidelines in ANSI N402-1976. In addition, there was a minor item noted that annual facility audits must be sent directly to the Dean of the College of Engineering, and not just to the Associate Dean for Research as has been done in the past. In general, none of these NRC findings involved any actual safety problems but rather involved a lack of supporting documenting procedures or other paperwork. Indeed, the modifications cited for lack of review was reviewed during the relicensing of the UFTR facility completed in 1982. As indicated, the UFTR continues to operate with an outstanding safety record. Similarly two inspections by representatives of the American Nuclear Insurers resulted in only one minor recommendation relative to frequency of inspections of the newly installed fire alarm system to assure compliance with federal regulations and assure protection of the facility and associated per-

* Unexpectedly, the discovery of the reoccurrence of the sticking S-3 control blade on September 3, 1985 has necessitated a continuing administrative shutdown through the first three months of the next reporting year as every effort is being made to preclude this occurrence from happening again.

sonnel.

The reactor and associated facilities continue to maintain a high in-state visibility and strong industry relationships. With the DOE Reactor Sharing Program to support UFTR-related research by faculty and students at other academic institutions as well as training for various community college and university programs around the state, the reactor facility is also maintaining high in-state visibility with these other institutions of higher learning.

With the renewed statewide usage, the facility is beginning to be included in proposals to provide for funded usage of the UFTR and the NAA Laboratory. The Reactor Sharing Program began in late 1983 and is directly responsible for the generation of several of these tentative proposals. If one or more of these proposals is submitted and funded, further increases in UFTR usage can be expected. In any case on-campus research usage of the UFTR is also increasing because of the visibility generated via the Reactor Sharing Program.

It is expected that more direct industry training will be accomplished in the upcoming year hopefully accompanied by further increases in research primarily through the use of the rabbit system and the associated NAAL facility both under the DOE Reactor Sharing Program and hopefully from research funded from other agencies, some of which has been developed from research begun under the Reactor Sharing Program.

## II. UNIVERSITY OF FLORIDA PERSONNEL ASSOCIATED WITH THE REACTOR

### A. Personnel Employed by the UFTR

N.J. Diaz - Professor and Director of Nuclear Facilities (continued on leave of absence)

W.G. Vernetson - Assistant Engineer and Acting Director of Nuclear Facilities (September, 1984 - July, 1986) promoted to Associate Engineer in August, 1985.

P.M. Whaley - Acting Reactor Manager (3/4 time) (September, 1984 - August, 1985)

H. Gogun - Senior Reactor Operator (part-time) (September, 1984 - August, 1985)

G. Fogle - Reactor Operator (part-time) (September, 1984 - August, 1985)

C.J. Stiehl - Student Reactor Operator Trainee (1/2 time)

W.M. Cason - Student Reactor Operator Trainee (1/3 time) (February - August, 1985)

### B. Radiation Control Office

D. Munroe - Radiation Control Officer (September, 1984 - August, 1985)

H.G. Norton - Assistant Radiation Control Officer (September, 1984 - August, 1985)

G.R. Renshaw - Radiation Control Technician (September, 1984 - August, 1985)

D.E. Perkins - Radiation Control Technician (September, 1984 - August, 1985)

B.M. DesRoches - Nuclear Technician (1/2 time) (September, 1984 - August, 1985)

R. Fayko - Nuclear Technician (1/3 time) (September, 1984 - December, 1985)

C. Reactor Safety Review Subcommittee

| | |
|---|---|
| M.J. Ohanian | - Chairman and Associate Dean for Research, College of Engineering |
| W.G. Vernetson | - Member (Reactor Manager and Acting Director of Nuclear Facilities) |
| J.A. Wethington, Jr.[1] and G.S. Roessler | - Member (NES Department Chairman) |
| W.E. Bolch | - Member-at-large |
| D. Munroe | - Member (Radiation Control Officer) |

D. Line Responsibility for UFTR Administration

| | |
|---|---|
| M.M. Criser, Jr.[2] | - President, University of Florida |
| W.H. Chen | - Dean, College of Engineering |
| J.A. Wethington, Jr.[3] | - Acting Chairman, Department of Nuclear Engineering Sciences (September 1, 1984 - April 30, 1985 and June 1, 1985 - Augusst 8, 1985) |
| W.G. Vernetson | - Acting Chairman (May 1 - May 31, 1985 and August 9 - August 19, 1985) |
| G.S. Roessler | - Acting Chairman (August 20, 1985 - August 31, 1985) |
| W.G. Vernetson[4] | - Acting Director of Nuclear Facilities |
| P.M. Whaley[5] | - Acting Reactor Manager |

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Note 1: G.S. Roessler currently holds the position of Acting Chairman, Department of Nuclear Engineering Sciences replacing Dr. J.A. Wethington, Jr. in August, 1985 as a search is underway for a permanent Chairman.

Note 2: Effective September 1, 1984, Mr. Marshall Criser is the new President of the University of Florida.

Note 3: Dr. John A. Wethington, Jr. served as Acting NES Chairman for most of the year except for two brief periods when Dr. W.G. Vernetson assumed the position in his absence (May 1 - May 31, 1985 and August 9 - 19, 1985) until August 20, 1985 when Dr. G.S. Roessler assumed the position of Acting Chairman until the search for a new permanent Chairman is complete.

Note 4,5: Dr. N.J. Diaz was on leave for the entire reporting year. In his absence, Dr. W.G. Vernetson continued in his appointment to the position of Acting Director of Nuclear Facilities with Mr. P.M. Whaley serving as Acting Reactor Manager.

E. Line Responsibility for the Radiation Control Office

| | |
|---|---|
| M.M. Criser, Jr. | - President, University of Florida |
| W.E. Elmore | - Vice President, Administrative Affairs |
| T.R. Turk | - Acting Director, Environmental Health and Safety (September 1, 1984 - October 7, 1984) |
| W.S. Properzio[6] | - Director, Environmental Health and Safety (October 8, 1984 - August 31, 1985) |
| D. Munroe | - Radiation Control Officer |

Note 6: The new Director of Environmental Health and Safety (Dr. William S. Properzio) assumed this position as of October 8, 1984.

## III. FACILITY OPERATION

The UFTR continues to experience growth in utilization in many areas when compared to the last reporting year, with total utilization continuing near the highest levels recorded in the early 1970's. This increase has been supported by a variety of usages ranging from industry educational and training programs to research and educational utilization by users within the University of Florida as well as other researchers and educators around the State of Florida through the support of the DOE Reactor Sharing Program.

As noted, the development of the Neutron Activation Analysis laboratory has improved research irradiation utilization. With successful implementation of the new remote sample-handling "rabbit" facility, efforts to advertise availability and encourage usage of the UFTR (especially for research) are proceeding favorably. Under the Reactor Sharing Program there has been significant usage by users from other schools with many more planned and some proposals for separate funding in progress. In addition, there have been a number of usages among researchers at the University of Florida with several more noted again this year. With one commercial research irradiation this year, it is hoped some additional commercial irradiations will be forthcoming during this next year to further complement UFTR operating activities.

The level of administrative work dedicated to regulatory activities is expected to be at an increased level during this next reporting year due to commitments made to NRC following the February 11-15 inspection citing the UFTR licensee for failure to properly control a modification and to implement a Quality Assurance in accordance with guidelines in ANSI Standard N402-1976. The facility response to the NRC inspection report is contained in Appendix A. The NRC notified acceptance of this response in a letter dated May 6, 1985.

Shown in Table I is a summary breakdown of the reactor utilization for

this reporting period. The list breaks UFTR utilization down into the 47 different research projects, various tests, teaching and training activities. The total reactor run-time was about 608 hours while the various experiments and other projects used over 1336 hours of facility time. The run time represents a decrease of ~15% from last year though there were many more concurrent usages during the current year to optimize utilization of available personnel. In contrast the experiment time represents an increase of nearly 15% without accounting for over 300 hours of concurrent experiment time. In summary these figures indicate continued growth in facility usage over the last three years despite the dramatic increases of over 300% noted last year.

Table II summarizes the different categories of reactor utilization: college and university teaching, research projects, UFTR operator training and requalification, utility operator training, testing, maintenance and surveillance activities, and various tours and reactor operations demonstrations which is a final category to account for all other planned usages. College course utilization involved 16 different courses, some more than once to account for over 130 hours of actual run time. The research utilization consisted of 13 projects using about 429 hours of actual reactor run-time. Again both these usages had considerable concurrent usage. As noted, there are increases in several areas from the last reporting year, especially in the research and training supported under the DOE Reactor Sharing Program. This program plus the two commercial utility training programs and the large amount of maintenance, testing and surveillance activities are primarily responsible for the total facility utilization continuing to be one of the highest in UFTR history especially since growth in UF course usage has leveled off. With utility training and outside research activities already scheduled for the upcoming year, this next year promises to produce facility utilization at a similar or even higher level. With the reoccurrence of the sticking S-3 con-

trol blade, this expected usage is very optimistic especially in the areas of college courses and research, though Category 4 may well increase substantially.

Table III contains a breakdown delineating the 7 schools and their 66 usages of the UFTR facilities which were sponsored under the Department of Energy Reactor Sharing Program grant. These sponsored usages account for about 20 hours of run time in Category I in Table II and over 190 hours of run time in Category II and have resulted in much improved visibility for the UFTR around the State of Florida and also among researchers and other users at the University of Florida. In all, the 66 usages represent a doubling from last year; while the total of 13 faculty is only a slight increase, the 100 students involved is nearly a 200% increase. Obviously this Program is the driving force behind the renewed utilization of the UFTR facility. With several proposals for funding in progress and one funded usage of the facility based on reactor sharing research results, the UFTR facility is gradually building a base for long-term permanent growth of facility utilization with the Reactor Sharing Program serving as the catalyst for this growth.

Detailed in Table IV are the monthly and total energy generation, as well as the hours at full-power per month and totals for this past year. The UFTR generated 35.88 Mw-hrs during this twelve month reporting period, down some 25% from last year but still the third largest value in UFTR operating history. This decrease is primarily due to more concurrent usage to optimize staff availability and due to much more time spent in experiment preparations where there was considerable growth as noted. Of course, there were several research usages such as for the Cerenkov Detector Development Project where the usage was lengthy but at relatively low or fluctuating power levels. The same low power operation applied during January in preparation for fuel inspection activities. Finally the 80% availability factor for the year did ac-

count for some considerable lost power generation and run time.

Described in Table V is the monthly breakdown of usage and availability data. As was noted in Section II of this report, extended forced outages for maintenance were responsible for low availability in October, February and March. Similarly, though available most of the month of January, the reactor was limited to low power operation in preparation for fuel inspection activities carried out in that month. Similarly, Table VI contains a detailed breakdown of days unavailable each month with a brief description of the primary cause. The overall availability of 80% is one of the lowest values in recent years as a considerable amount of major maintenance was performed.

Described in Table VII-A are the reasons and dates for four unscheduled trips for the reporting period. Table VII-B contains a similar tabulation for 14 scheduled trips. All safety systems responded properly for all trips. Several reportable incidents occurred during this reporting year. Table VIII contains a descriptive log of fourteen (1) unusual occurrences with brief evaluations of each. Each is described in some detail as several were promptly reportable while the rest are reported in this report and in several cases do not need to be reported at all.

No uncontrolled releases of radioactivity have occurred from the facility and controlled releases are well within established limits. The personnel radiation doses were somewhat above the usual low level primarily due to the thermocouple maintenance project in October as delineated in Section VII. Environmental radioactivity surveillance continues to show no detectable offsite dose attributable to the UFTR facility as also noted in Section VII.

TABLE I

SUMMARY OF FACILITY UTILIZATION
(September, 1984 - August, 1985)

NOTE: The projects marked with a * indicate irradiations or neutron activations. The projects marked with an ** indicate training/educational use. The projects marked with an *** indicate demonstrations of reactor operations. "Experiment Time" is total time that the facility dedicates to a particular use, it includes "Run Time." "Run Time" is inclusive time commencing with reactor startup and ending with shutdown and securing the reactor.

| PROJECT AND USER | TYPE OF ACTIVITY | RUN TIME (hours) | EXPERIMENT TIME (hours) |
|---|---|---|---|
| **ENU 4905/6937 - Dr. W.G. Vernetson/ Reactor Staff | Independent Reactor Operations Laboratory Course for Undergraduate and Graduate Nuclear Engineering Students | 103.32 (23.52) | 184.88 (20.96) |
| *Fla. Foundation for Future Scientists (NAA Research) - Dr. W.G. Vernetson/ John Carswell | Continuation of Summer 1984 Student Research Program: NAA of Potential Hogtown Creek Contaminants | 46.77 (19.55) | 51.35 (20.51) |
| *NAA Research - Dr. G. Chiu/Dr. Ranga Rao - University of West Florida - Reactor Sharing | Evaluation of Uptake of Heavy Metals in a Seagrass Community | 141.32 (50.85) | 147.60 (54.92) |
| **Operator Training - Dr. W.G. Vernetson/ Reactor Staff | Reactor Operations Training for Reactor Operator Candidates (C.J. Stiehl and W.M. Cason) | 31.34 (20.68) | 91.37 (45.54) |
| Transient Simulation Research With DSNP - Dr. E.T. Dugan | Verification of DSNP Simulator Calculations of Various UFTR Transients | 2.15 | 2.83 |
| **Radiation Surveys/ RadCon Training - Radiation Control | Radiation Surveys of UFTR Cell and Environment at Steady-State Full Power Plus Training of Radiation Control Personnel (Including Second Person Qualification) | 16.60 (14.90) | 20.18 (10.73) |
| *NAA Research on Electronic Components - Dr. V. Ramaswamy, UF Elec. Eng. Dept. | Analysis of Silver Diffusion in Silicate Glass Slides for Microchip Applications | 20.68 (14.75) | 21.93 (15.15) |

TABLE I (CONTINUED)

| PROJECT AND USER | TYPE OF ACTIVITY | RUN TIME (hours) | EXPERIMENT TIME (hours) |
|---|---|---|---|
| **Santa Fe Community College Nuclear Medicine Radiologic Technology Program - S. Marchionno - Reactor Sharing | Lectures, Tours and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises | 3.16 | 7.67 |
| Cerenkov Detector Development - Dr. E.E. Carroll | Reactor Radiation Measurements To Test and Calibrate a New Cerenkov Radiation Detector System | 48.95 (7.95) | 117.79 (10.17) |
| **ENU-5005 - Dr. A.M. Jacobs | Lecture, Tour and Demonstration of Reactor Operations for Non-Nuclear Engineering Students | 0.42 | 1.42 |
| **Central Florida Community College Radiation Protection Technology Program - G. Stephenson | Lectures, Tours and Demonstrations of Reactor Operations and NAA Exercises With Radiation Surveys and NAA Training Exercises | 2.58 | 6.25 |
| **ENV 4201 - Dr. C.E. Roessler | Lecture, Tour and Reactor Facility Instrumentation and Operations Demonstration | 1.82 (0.75) | 4.84 |
| **ENV-6211 - Dr. C.E. Roessler | Lecture, Tour and Demonstration of Reactor Facility Capabilities and Reactor Operations | 1.00 | 2.08 |
| **Senior Reactor Operator Hot License Candidate Training - Dr. W.G. Vernetson | Reactor Operation Training for Florida Power Corporation Shift Supervisor SRO Candidates | 18.38 | 24.95 |
| **Reactor Operator Hot License Candidate Training - Dr. W.G. Vernetson | Training Course for Florida Power Corporation Crystal River 3 Hot License Operator Candidates | 73.23 | 110.05 |
| ***UF Freshman Honors Program - Bert Hickman | Lecture, Tour and Demonstration of Reactor Operations | 1.15 | 3.42 |
| Argon-41 Effluent Determinations - Dr. W.G. Vernetson/ Reactor Staff | Argon-41 Stack Concentration Measurements and Evaluation | 13.20 (2.38) | 20.25 (2.97) |

TABLE III

1984-1985

REACTOR SHARING PROGRAM

SUMMARY USAGE OF UFTR FACILITIES

| School | Usages* | Users | |
|---|---|---|---|
| | | Faculty | Students |
| Central Florida Community College (CFCC) | 26 | 2 | 35 |
| Florida State University | 7 | 2 | 3 |
| Hillsborough Community College (HCC) | 1 | 2 | 28 |
| Santa Fe Community College (SFCC) | 3 | 1 | 22 |
| St. Augustine High School (SAHS) | 1 | 1 | 9 |
| University of South Florida, St. Petersburg (USF-SP) | 5 | 2 | 1 |
| University of West Florida (UWF) | 23 | 3 | 2 |
| TOTAL | 66 | 13 | 100 |

* Usage is defined as utilization of the University of Florida Training Reactor for all or any part of a day. In many cases a school can have multiple usages but all related to the same research project or training program.

TABLE IV

MONTHLY REACTOR ENERGY GENERATION[1]
(September, 1984 - August, 1985)

| Monthly Totals | Kw-Hrs | Hours at Full Power |
|---|---|---|
| September, 1984 | 2523.39 | 25.03 |
| October, 1984 | 2533.04 | 24.50 |
| November, 1984 | 3044.72 | 27.72 |
| December, 1984 | 2031.23 | 14.23 |
| January, 1985 | 2338.47 | 22.30 |
| February, 1985 | 00.00 | 00.00 |
| March, 1985 | 3813.46 | 37.23 |
| April, 1985 | 5524.84 | 53.87 |
| May, 1985 | 3270.83 | 32.55 |
| June, 1985 | 3095.47 | 30.90 |
| July, 1985 | 4874.31 | 48.11 |
| August, 1985 | 1929.17 | 19.25 |
| YEARLY TOTAL | 35,878.93 [2] | 345.69 |

Note 1: Kw-Hrs yearly total for the 1984-1985 reporting year represents a 24% decrease over the previous reporting year while the hours at full power represent a similar 24.5% decrease over the previous year. Although the 24% decrease is significant, this decrease is calculated relative to the highest values ever recorded during the 1983-1984 reporting year. In actuality the energy generation was very good considering the loss of two full time staff members the previous year who now work part-time but without replacement in the staff. In addition, the total run time for the facility was actually higher for this reporting year indicating more low power usage for several projects such as the Cerenkov Detector Development. Finally, several large maintenance projects during the year prevented still larger hours of facility utilization.

Note 2: The 35,878.9 Kw-Hrs of energy generation is the third highest one year total energy generation for the 26-year history of the UFTR.

TABLE V

MONTHLY REACTOR USAGE/AVAILABILITY DATA

(September, 1984 - August, 1985)

| Monthly Totals | Key-On Time | Exp. Time[1] | Run Time | Availability |
|---|---|---|---|---|
| September, 1984 | 46.60 hrs. | 64.30 hrs. | 40.95 hrs. | 83.3% |
| October, 1984 | 50.50 hrs. | 104.11 hrs. | 42.87 hrs. | 71.0% |
| November, 1984 | 70.40 hrs. | 141.49 hrs. | 65.22 hrs. | 86.7% |
| December, 1984 | 107.00 hrs. | 172.82 hrs. | 98.75 hrs. | 83.9% |
| January, 1985 | 34.40 hrs. | 107.34 hrs. | 28.04 hrs. | 83.9% |
| February, 1985 | 5.90 hrs. | 110.75 hrs. | 0.60 hrs. | 0.0% |
| March, 1985 | 77.30 hrs. | 134.04 hrs. | 74.90 hrs. | 80.9% |
| April, 1985 | 94.70 hrs. | 131.96 hrs. | 86.32 hrs. | 100.0% |
| May, 1985 | 51.90 hrs. | 92.50 hrs. | 43.24 hrs. | 100.0% |
| June, 1985 | 43.80 hrs. | 90.93 hrs. | 38.24 hrs. | 90.0% |
| July, 1985 | 70.00 hrs. | 140.40 hrs. | 65.04 hrs. | 93.5% |
| August, 1985 | 26.20 hrs. | 47.68 hrs. | 22.95 hrs. | 83.9% |
| TOTALS: | 678.70 hrs. | 1338.32 hrs. | 607.12 hrs. | 79.8%[2] |

NOTE 1: Experiment Time is Run Time (Total Key-On Time minus Checkout Time) plus set-up time for experiments, tours, or other reactor usage including checkouts, tests and maintenance involving reactor running or facility usage.

NOTE 2: Monthly Average availability is 79.8%; on the basis of days of the year, the availability is 82.3% as indicated in Table VI.

TABLE VI

UFTR AVAILABILITY SUMMARY

(September, 1984 - August, 1985)

| Month | Availability | Days Unavailable | Primary Cause of Lost Availability |
|---|---|---|---|
| September, 1984 | 83.3% | 5 days | Thermocouple/Thermocouple Lead Failure |
| October, 1984 | 71.0% | 9 days | Thermocouple Replacement |
| November, 1984 | 86.7% | 4 days | Repair/Replacement of Failed Core Vent Fan and Repair of Temperature Recorder |
| December, 1984 | 83.9% | 5 days | Staff Vacations |
| January, 1985 | 83.9% | 5 days | Discovery of Sticking S-3 Control Blade |
| February, 1985 | 0.0% | 28 days | Maintenance and Repair of S-3 and Other Control Blades |
| March, 1985 | 80.9% | 6 days | Completion of Maintenance and Overhaul on Control Blade Drive Systems External to Biological Shield |
| April, 1985 | 100.0% | 0 days | ------------- |
| May, 1985 | 100.0% | 0 days | ------------- |
| June, 1985 | 90.0% | 3 days | Staff Vacations |
| July, 1985 | 93.5% | 2 days | Failure and Replacement of Evacuation Siren Motor and Work on Core Vent Fan Motor |
| August, 1985 | 83.9% | 5 days | General Maintenance/Staff Vacations |

TOTAL ANNUAL UNAVAILABILITY: 72 days

TOTAL ANNUAL AVAILABILITY: 293 days = 80.3%

NOTE 1: This availability summary neglects all minor unavailabilities for periods smaller than a half-day. In most cases these periods are for less than an hour.

NOTE 2: As indicated elsewhere, the thermocouple repair work and the maintenance and repair work on the Control Blade Drives accounts for most (53 days or nearly 3/4) of the unavailability.

TABLE VII-A

UNSCHEDULED TRIPS*

| Date | Description of Occurrence |
|---|---|
| September 25, 1984 | Reactor tripped at 100 kw on high primary temperature indication on temperature recorder for point #4 (Exit of Fuel Box #4) due to faulty thermocouple and/or thermocouple connection. The trip evaluation showed that all safety systems responded to perform their intended safety function. All core exit line thermocouples and lead wires were subsequently replaced with no further problems noted. |
| June, 1985 | At 1429 the operator (P.M. Whaley) noted an electrical transient that caused a trip during a reactor startup conducted as a training operation. The cause was determined to be the electrical transient as noted by the operator, by other personnel in Building #557 and as supported by a substation operator who reported to utility services that a 69 kv breaker had shifted. The trip evaluation showed that all safety systems responded as designed. |
| June 20, 1985 | At 1249 the operator (W.G. Vernetson) noted a trip due to loss of secondary cooling while on well water cooling. The pump loss was caused by fuse failure, apparently due to poor connections. All connections were cleaned and fuses were replaced. The trip evaluation showed that all safety systems responded as designed. |
| July 2, 1985 | At 1316 while taking logs, the operator (W.G. Vernetson) noted a trip on loss of secondary flow caused by loss of the well pump following nearly 6.5 hours of full power operation to irradiate samples for subsequent neutron activation analysis. The pump loss was caused by fuse failure, apparently due to poor connections causing overheating of the fuse assembly. All connections were cleaned and 60 amp fuses were replaced. The trip evaluation showed all safety systems responded as designed. |

* All safety systems responded as intended for the trips listed in this Table.

## TABLE VII-B

## SCHEDULED TRIPS

| Date | Description of Occurrence |
|---|---|
| September 13, 1984 | Experimental trip designed to provide transient temperature data for application in analysis work with the Dynamic Simulation for Nuclear Power Plant (DSNP) code; the reactor was tripped by securing secondary water at 100 kw as part of run request 84-30. |
| November 29, 1984 | Training trip where reactor was tripped on simulated loss of secondary coolant flow. |
| December 17, 1984 | Training trips (two) where reactor was tripped on reduced secondary coolant flow. |
| December 18, 1984 | Training trips (two) where reactor was tripped on simulated loss of diluting fan flow. |
| December 19, 1984 | One training trip where reactor was tripped by manual intermittant operation of the evacuation alarm. |
| December 20, 1984 | Training trips (two) where reactor was tripped on simulated loss of diluting fan flow. |
| December 20, 1984 | One training trip where reactor was tripped on simulated loss of secondary coolant flow. |
| December 21, 1984 | One training trip where reactor was tripped on simulated loss of diluting fan flow. |
| December 21, 1984 | One training trip where reactor was tripped on simulated loss of secondary coolant flow. |
| May 23, 1985 | Two experimental trips were used as part of an effort to develop a standard alternate method for verifying that the UFTR void coefficient is negative. As approved on Run Request 85-18, the UFTR was manually tripped from 1 watt power level two times. The first time the scram bar was used to provide a blade drop trip; the second time the console switch was cycled to provide a full trip involving a blade drop plus dumping of the primary water. All systems responded as expected for this exercise. More data is needed to complete the development of this method to verify a negative void coefficient. |

NOTE: There were a total of fourteen (14) scheduled trips performed for training or experimental purposes during this reporting year.

## TABLE VIII

## LOG OF UNUSUAL OCCURRENCES

During this reporting period there were no events which compromised the health and safety of the public. Several events, classified as unusual occurrences, are described below as they deviated from the normal functioning of the facility and are included here as the most important such deviations for the reporting year.

| | |
|---|---|
| 25 September 1984 | - Reactor tripped at 100 kw on high primary temperature indication on temperature recorder for point #4 (Exit of Fuel Box #4) due to a faulty thermocouple and/or thermocouple connection. There was no compromise of safety as all safety systems responded properly. Inspection showed several of the thermocouple connections at the fuel box outlets, especially those on the North side of the core (temperature recorder points #4, #5 and #6) to be degraded due to high radiation fluence. All six thermocouples at the fuel box outlets were replaced and new connections made with fresh wire with no further problems noted. |
| 19 November 1984 | - Failure of the vent fan system (fan motor failure) was discovered at shutdown conditions on the afternoon of November 18, 1984. The failure was caused by excessive vibration which had in turn caused the vent fan motor to come loose from its mounting and fail. The motor bearings were replaced and the entire motor remounted. There was no compromise of safety as all safety systems responded properly; the vent fan system trip specifically was still operable so this event would have tripped the reactor if the reactor had been operating at the time of failure. In addition, the fan motor failure caused the vent damper to close as designed. Therefore, there was no compromise of safety features and all safety systems responded properly for this occurrence. |
| 26 November 1984 | - Failure of the vent fan system occurred again at shutdown conditions and was again due to motor failure caused by excessive vibration. This time the entire motor was reworked including bearing replacement; in addition the motor mounting was reworked and the impeller rebalanced to reduce vibration to levels below those prior to the original failure. Since all safety systems responded properly, there was no compromise of safety. |

9 December 1984 - Mr. H. Gogun (a senior reactor operator) was discovered to have performed licensed activities during the previous week without meeting one of his license conditions (submitting a 6-month blood sugar test). Evaluation of this occurrence by the Reactor Safety Review Subcommittee and UFTR Facility administration indicated there was no compromise of safety; however, since potential violation of the UFTR Technical Specifications was involved, prompt notification of NRC was made and followed up by a special report. Mr. Gogun was removed from licensed duties until notification of license renewal was received from NRC. In addition, administrative controls were implemented to prevent recurrence of this event.

11 December 1984 - Following intermittant failure of the red pen to track properly during a daily checkout, the red pen was found to have a floating ground causing the intermittant problem; compensating voltage power supply ground was jumper connected to chassis ground to assure proper ground with no further problem evident.

26 January 1985 - Following a brief demonstration power run and a normal shutdown, the effect of a rod drop for a large negative reactivity insertion was being demonstrated. One of the UFTR control blades (Safety Blade #3) was removed to about 300 units and the clutch current interrupted but the S-3 blade failed to drop fully into the core as it hung up at about 270 units withdrawn. This failure (sticking at about 27% removed) was discovered during a demonstration when the reactor was shutdown except for the control blade removal in question. The S-3 blade was subsequently driven in with no further problems encountered to secure the reactor. The blade was found to be sticking primarily in the 270-350 units withdrawn position when dropped from less than the fully withdrawn position. At full withdrawn, the insertion time was still within the <1 second Tech Spec limit. Evaluation of this occurrence by the Reactor Safety Review Subcommittee and UFTR Facility administration indicated there was no compromise of safety; however, since potential violation of the UFTR Technial Specifications was involved, prompt notification of NRC was made and followed up by an interim and a final special report as required by the UFTR Technical Specifications.

26 January 1985 (continued) Inspection of the control blade right angle drive system produced one badly worn right angle shaft bearing and deformed shim on the clutch housing. The cork shim on the clutch housing was replaced with aluminum shim to control deformation and both of the bearings on the right angle shaft were replaced with identical bearings. This maintenance restored proper operation to the S-3 control blade; the other three blade systems were subjected to the same inspection and preventive maintenance work with clutch housing shim deformation found in all and some wear showing on the other bearings. All gears were also greased and the reactor placed back in service following a complete set of tests to include measurements of control blade controlled insertion, controlled removal and full out drop times as well as verification of full insertion upon interruption of clutch current from a series of blade heights.

20 February 1985 - The primary coolant loop rupture disk was broken due to operator error. The operator was approved to perform a daily checkout but work in progress on Safety Blade #3 (disconnected from shaft) resulted in water being dumped (dump valve opened) when S-1 was withdrawn ~25 units and tripped for interlock checks. When the operator then restarted the pump, the disk was broken by the water hammer produced by the dump valve closure prior to full draining of the system. Primary coolant sample was surveyed by Radiation Control and the pit entered for normal cleanup and replacement of the rupture disk. The system was restored to normal operation without further incident; in addition, all operators were warned of the effect of a disconnected blade acting logically like a removed blade.

7 March 1985 - During a positive period measurement of reactivity worth based on 10 second (controlled) withdrawal of the S-1 control blade with power about 10 watts, the S-1 position indication went to 000 with no change in period. Although there was no change in reactivity, the operator shut down and secured the reactor and notified the Reactor Manager of the unscheduled shutdown; the suspected cause was a problem with a loose and partially oxidized cable connector which was disconnected and cleaned to remove corrosion deposits. Subsequent movement of the S-1 blade for full withdrawal and full insertion was satisfactory. All four (4) cables for the four (4) control blades were subsequently checked for proper seating in the connectors with no further problems noted as the reactor was returned to service.

20 June 1985 - At 1249 hours, there was a trip of the UFTR from full power following about five hours of full power operation. The trip was caused by failure of the fuse on the well pump motor "b" phase due to contact degradation on the "b" phase contact. The loss of the pump caused the loss of secondary cooling and resulted in the trip (Safety Blades S-1, S-2, S-3 dropped from 640 units, Regulating Blade from ~578 units). The subsequent evaluation determined that no safety limits were exceeded and all safety systems responded as designed. All well pump fuses were removed, the overheated connection reterminated, new fuses installed and the well pump tested and demonstrated to be operating properly. The trip evaluation was completed and restart was recommended providing the daily checkout was satisfactory.

During the subsequent daily checkout prior to restart, the Safety #2 control blade (S-2) would not withdraw upon demand. Subsequent investigation was carried out to determine the cause. After several checks, the clutch was suspected to be slipping; therefore, the clutch voltage was increased from 53 volts to 56 volts with the blade then found to be properly responding to a demand for removal. These two voltages are both well within the 40-90 volts range recommended in the technical manual for the clutch voltage. The voltage was then reset back to the original 53 volts for checkout of the system.

All subsequent checks showed a normal response and the reactor was returned to service following RSRS approval on June 21 and after discussions with Paul Frederickson at NRC on June 21 recommending only that a report be filed. (See NRC report dated 1 July 1985.) The UFTR staff, the RSRS and NRC Region II all agreed this event did not compromise reactor safety nor did it compromise the health and safety of any personnel or the public.

2 July 1985 - At 1316 hours, there was a trip of the UFTR from full power following about 6.5 hours of full power operation. The trip was caused by the failure of the fuse on the well pump motor "b" phase due apparently to contact degradation leading to fuse failure by overheating. The loss of the pump caused the loss of secondary cooling and resulted in the trip (Safety Blades S-1, S-2, S-3 dropped from 640 units, Regulating Blade from ~589 units). The subsequent evaluation determined that no safety limits were exceeded and all safety systems responded as designed.

2 July 1985 (continued)

- Since this same type of trip had occurred on 20 June 1985, after which Safety Blade #2 would not withdraw upon demand, the trip evaluation recommended concluding the irradiation in progress using the alternate city water cooling system provided the required check of the city water scram logic was successful and provided the temperature trip, period trip, safety channel #1 and #2 trips and calibration checks on Safety Channel #1, Safety Channel #2, Log N, Period and Linear Pen were all satisfactory. The city water was recommended so the work to clean the pump contacts and replace the fuses could be carried out independently. The subsequent restart noted that Safety Blade #2 withdrew on demand under conditions and in a time frame nearly identical to those of the June 20 occurrence when the S-2 blade initially did not withdraw upon demand. The subsequent reactor operation was concluded without further incident.

Following completion of the cleaning of the pump contacts and replacement of all fuses, it was noted that the failed fuse was not the same one as the one fuse that failed on June 20 to cause a similar trip. The deep well secondary cooling system was returned to service on July 3 and determined to be working satisfactorily. However, the box containing the fuse holders was later checked and found to be very warm following extended operation of the deep well pump for secondary cooling. As a result, various currents and voltages inside the cell and inside the fuse box were checked and found to meet specifications. Because the fuse box was hot during running apparently indicating contacts degraded beyond the point of simple cleaning as a fix, it was decided to replace the entire fuse box assembly holders and switch plus tighten all connections in both switch boxes and contactor. This maintenance was completed on July 8, 1985. Subsequently the fuse box was checked several times and found to be much cooler during running of the secondary cooling system (deep well pump). As a result of this work and evaluation, a source of several reactor trips over the past year is considered to be eliminated.

LOG OF UNUSUAL OCCURRENCES (CONTINUED)

17 July 1985 - At 0755 hours, following a successful pre-operational checkout in which loose contacts on the chopper coil of the red pen were tightened, the Acting Reactor Manager (P.M. Whaley) commenced a reactor startup. However, at 0800 the linear (red) pen was noted to stop functioning so an unscheduled shutdown was performed and the reactor secured. The chopper was removed and its contacts and others on the two pen recorder were cleaned. The two pen recorder was returned to service following checks showing satisfactory operation. Reactor operation to full power was satisfactory. However, at 0918 the operator (G.W. Fogle) commenced another unscheduled shutdown when the operation of the linear (red) pen became excessively noisy and intermittent.

The source of this intermittant operation was traced to the amplifier circuit where a leaking capacitor was replaced. In addition, all solder joints and runs were inspected with several found to be possible sources of the intermittant failure. All were repaired. Subsequent tests showed satisfactory operation. Subsequent operation of the two pen recorder to the end of August has been without failure as the source of this intermittant failure has been removed.

22 August 1985 - While the reactor was shutdown for quarterly scram checks, the primary coolant storage tank was overfilled resulting in wetted core vent filters. Although the radiation and radioactivity levels were somewhat elevated above background during the maintenance work to replace them, the entire filter replacement and cleanup project were completed without problems under RWP 85-7-II.

22 August 1985 - The flow scram switch in the primary coolant return line was found to be failed during routine checks associated with the quarterly scram function checks. The reed switch contacts were welded shut due to a short circuit. The switch itself was removed and an identical spare installed and checked out. Subsequent checks of the return line flow scram showed proper actuation on loss of flow. This failure was discovered during a scheduled surveillance check by the Acting Reactor Manager who indicated he caused a short by making an incorrect accidental connection prior to the check. In addition, this trip function has a redundancy since there is also a 30 gpm flow scram on the core inlet line which was found to be functioning properly. Therefore, based on technical specifications defining prompt reportability requirements, no prompt report was made.

## IV. MODIFICATIONS TO THE OPERATING CHARACTERISTICS OR CAPABILITIES OF THE UFTR

A number of modifications were made to the operating characteristics or capabilities of the UFTR facility during the reporting period. These modifications were all subjected to 10 CFR 50.59 evaluations and then determinations as necessary to assure no unreviewed safety questions were involved. In general, these modifications are subdivided into two categories - temporary or permanent - and are addressed in chronological order in the following listing and associated description.

1. Replacement Modification of Annex Evacuation Siren Motor (Temporary)

   7 January 1985 - 5 August 1985

   After the original motor in the annex evacuation siren burned up following extended continuous operation for an emergency drill, a series of acceptable but temporary substitutes were utilized until the same motor could be obtained for replacement. On 7 January, the series wound evacuation siren motor was replaced with a synchronous motor which burned out. On April 8, an induction motor was installed but it later burned out also. On 22 July a solid state device was installed temporarily after checking to assure the resulting siren would be effective. Since no trickle current could be used to assure operability in the control room as part of the daily checkout, the siren was checked by running it as part of the daily checkout until a duplicate replacement for the original motor was obtained and installed on 5 August 1985 to close out this modification.

2. UFTR Building #557 Automatic Fire Alarm System Upgrade (Permanent)

   11 February 1985

   Following extensive reviews of automatic fire alarm system requirements in the UFTR building, the existing two zone system (Reactor Cell, Remainder of Building) was replaced with a four zone system (Reactor Annex, Reactor Cell, Controlled Access Area, Remainder of Building). In addition to an increase in pull stations, smoke detectors were added for the Reactor Annex and for the UFTR Staff Office Area outside the reactor cell as recommended in several reports by American Nuclear Insurer Inspectors.

   Work on the fire alarm system installation at the UFTR was completed in February. All checks of the systems on February 11 by W.G. Vernetson, P.M. Whaley, Keith Stephens (Engineering), Dyke Dutra (Physical Plant) and Ray Knowles of Total Securities, Inc. showed the system to be complete and functional. The four-zone UFTR system is completely operational with no overnight downtime as required to avoid fire watches including a dedicated telephone line to UPD.

On February 20, 1985, Mr. G. Nuce along with P.M. Whaley and a Centrex Fire Alarm Maintenance Engineer rechecked the system for operational capability and found it to be complete. The existence of several imperfect solder connections in one of the plug-in modules of the UFTR system were noted; these connections do not affect current operation but could cause the system to give an alarm after less than normal usage. Therefore, the installing company is being requested to replace the module. The UFTR administration considers the UFTR system operational; it represents additional fire protection over that specified in the FSAR.

3. Control Blade Clutch Housing Shim Modification (Permanent)

26 February - 2 March 1985

As part of the corrective and then preventive maintenance performed on all four control blade drive systems external to the biological shield, the compressed and decomposing cork material comprising the shim material between the two halves of the clutch housing was replaced with relatively incompressible aluminum metal shim between the halves of all four clutch housings. The objective was to replace the compressible cork material subject to gradual decomposition with aluminum which would prevent excessive force on the clutch by assuring proper spacing. The details of this modification were evaluated not to involve an unreviewed safety question will full implementation incorporated as part of the corrective and preventive maintenance performed on the control blade drive systems. The full final summary report to NRC on the sticking S-3 control blade problem to include notification, corrective action, preventive maintenance including the shim modification, and final tests and surveillances is contained in Appendix B of this report.

4. Installation of Vent/Dilutant Fan Interlock With Evacuation Alarm

(Permanent) 16 May 1985

This modification was actually performed in October 2, 1982. However, in response to the notice of deviation cited in NRC Inspection Report No. 50-83/85-01 dated 18 March 1985, a complete recheck was made of the design and installation of the interlock. This complete documentation included checking the interlock circuit as implemented and producing a final drawing of the interlock circuit as installed on 15 May 1985. No changes were made during this effort. Finally, a complete evaluation and determination was made of the modification to assure proper documentation existed to assure no unreviewed safety questions were involved with final closeout of the modification completed on 16 May 1985. As noted in the response to the NRC Inspection Report contained in Appendix A, the UFTR licensee had performed these reviews in 1982 but some of the documentation was found to be incomplete during the February, 1985 inspection. The final drawing of this modification is contained in this Section as Figure 1.

5. Vent Fan Motor (3450 rpm)/Paddle Impeller Rotor Replacement With 1725 rpm Motor and Squirrel Cage Rotor (Permanent)

19 July 1985

Maintenance was performed on the vent fan motor, mounting assembly and paddle impeller rotor on several occasions during the reporting year (21 November 1984, 26 November 1984, 15 July 1985). On the basis of this periodically recurring problem caused by excessive vibration, a modification was designed and installed. Basically a new three phase motor of lower speed (1725 rpm versus 3450 rpm) was installed on 19 July 1985 along with a lighter squirrel cage rotor assembly to reduce the likelihood of vibration-induced failures. Since vent flow rates are maintained at unreduced levels, as verified following installation, this modification was evaluated and found to involve no unreviewed safety questions. Operation to date has been without failure.

6. Clamp Stop Installation on Vent Fan Damper (Temporary)

22 July - 25 July 1985

Following installation of the modified vent system fan motor and squirrel cage rotor, the damper motor/operator assembly was found to be malfunctioning by opening past its stop when closing. A clamp stop was installed temporarily on the vent fan operator housing to prevent excessive motion of the operator to reopen the damper following shutdown of the system. The temporary clamp on the vent fan damper was removed on 25 July 1985 as a new damper motor/operator assembly was installed. This temporary modification was evaluated and found to involve no unreviewed safety questions.

7. Annex Basement Lab Installation (Permanent)

In progress at year's end.

Part of the reactor building annex basement is being converted to a materials microscopy laboratory for the Materials Science and Engineering Department. Installation of this laboratory will affect the internal contents of the basement primarily to include isolating one half of the annex basement from the Reactor Support Shop Facility. This building modification was found to represent no unreviewed safety questions as it is essentially a passive change to the internal arrangement of the annex basement with one exit added. This modification was not complete at the end of the reporting year but is expected to be completed during the upcoming reporting year.

8. Center Vertical Port Graphite Multiple Sample Holder (Temporary)

Available at year's end but not used.

On 2 July 1985 a new modification designed for use within the center vertical port area was approved from drawings and a detailed Reactor Run Request completed as per requirements of UFTR SOP-A.5. The device was then manufactured and is now available for multiple sample irradiations in the center vertical port area. The holder consists of a piece of reactor grade graphite with holes drilled to hold 10 small samples for long-term irradiation. The sample holder will actually replace the one piece of graphite with the single center vertical hole in it that is currently used when irradiations for NAA of rare earth samples are performed.

At the end of the reporting year the device was manufactured but no characertizing measurements had yet been run on it. This temporary modification, when in place, will not be movable and has been evaluated and found to involve no unreviewed safety questions. It will be thoroughly characterized for reactivity effects prior to experimental usage. A drawing of this assembly is included in Figure 2 at the end of this Section. The implementation of this temporary experimental modification will be completed during the upcoming year.

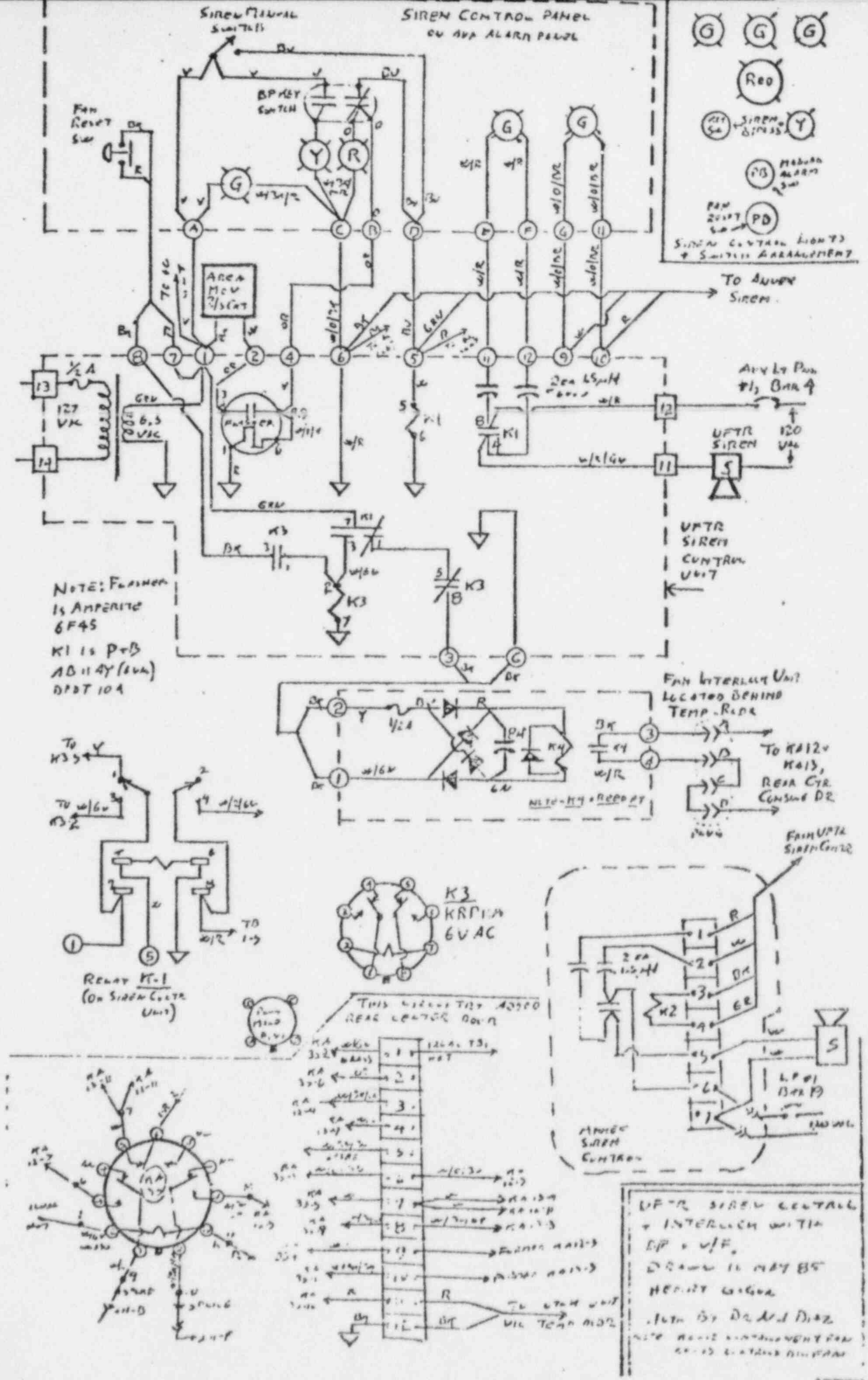

FIGURE 1. Vent/Dilutant Fan Interlock Circuit Approved 16 May 1985
As Installed 2 October 1982

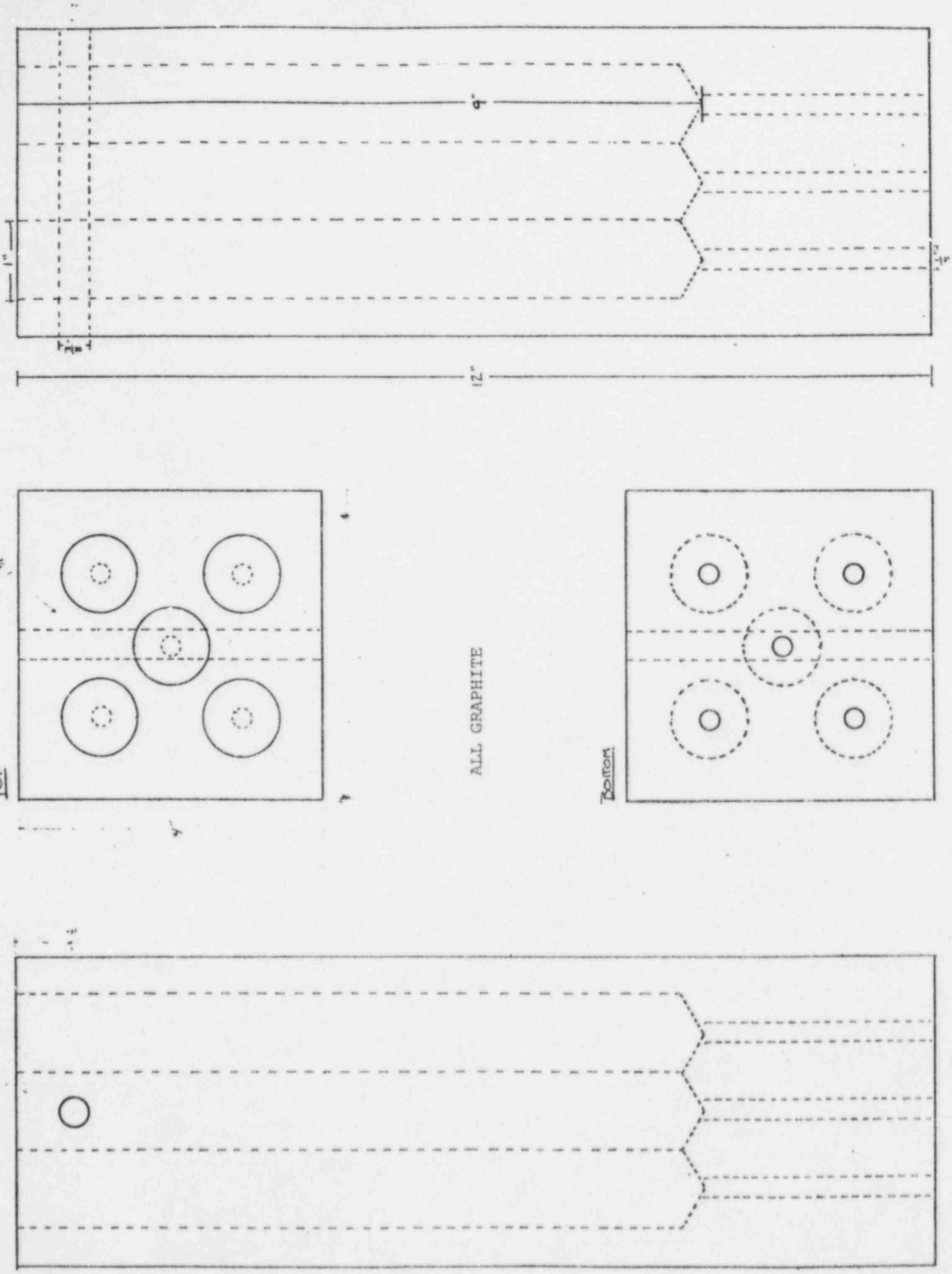


FIGURE 2. Center Vertical Port Area Graphite Multiple Sample Holder

## V. SIGNIFICANT MAINTENANCE, TESTS AND SURVEILLANCES OF UFTR REACTOR SYSTEMS AND FACILITIES

Records for the 1984-1985 reporting year show extensive maintenance was performed particularly in such areas as replacement of primary coolant core outlet thermocouples and lead wires, corrective and preventive maintenance on all four control blade drive systems external to the biological shield, complete overhaul and corrective maintenance on the two-pen recorder, corrective maintenance and finally replacement with a modification of the core vent motor blower system. In the table that follows all signficant maintenance, tests and surveillances of UFTR reactor systems and facilities are tabulated and briefly described in chronological order; this tabulation includes administrative checks as well. Surveillance tests or other checks/maintenance required by the Technical Specifications, NRC commitments or other administrative controls are designated with a prefix letter and a number; otherwise the items listed are considered maintenance, though in the area of the maintenance on control blade drive systems, this work actually constitutes part of the V-1 Blade System Mechanical Checks required to be performed for the entire reactor control system every five years as specified in the UFTR Technical Specifications Surveillance Requirements, Section 4.2.2, Paragraph 4.

| Date | Description |
|---|---|
| 17 September 1984 | Decontaminated the glove box/receiving station for the pneumatic delivery system. |
| 17 September 1984 | Q-4/Q-5 Radiation Surveys of Unrestricted and Restricted Areas. |
| 28 September 1984 | Completed overhaul of two-pen recorder to include installing a new slide wire and new bushings. |
| 28 September 1984 | Q-3 Quarterly Radiological Emergency Drill. |
| 1 October 1984 | S-3 Semiannual Inventory of Special Nuclear Material. |
| 5 October 1984 | S-6 Semiannual Inventory of Security-Related Keys. |
| 29 October 1984 | Q-1 Quarterly Check of Scram Functions. |
| 30 October 1984 | Heavy Water Inventory for Department of Energy. |
| 31 October 1984 | Q-2 Quarterly calibration check of area and stack radiation monitors. |
| 9 October 1984 | Completed restacking of reactor shielding and checkout of reactor following replacement of fuel box outlet thermocouples and retermination with new lead wire. |
| 8 October 1984 | Reconnected and checked out proper operation of pit sump alarm. |

| Date | Description |
|---|---|
| 9 October 1984 | Adjusted microswitch arm on pit sump alarm module in control room to assure proper activation of buzzer. |
| 9 October 1984 | Checked out and cleaned contacts on Safety Blade 2 to assure proper withdrawal on demand. |
| 10 October 1984 | Reterminated thermocouple #9 on heat exchanger secondary side. |
| 25 October 1984 | Tightened pump valve packing following minor seepage. |
| 29 October 1984 | Replaced shield tank filter and added ~20 gallons of demineralized water to shield tank. |
| 1 November 1984 | Q-2 Quarterly Calibration Check of Stack Radiation Monitor. |
| 9 November 1984 | Replaced the compensating voltage power supply for the linear (red) pen on the two-pen. |
| 9 November 1984 | S-8 Checked Sb-Be Source for Leakage. |
| 14 November 1984 | S-8 Checked Pu-Be Source (M-79) for Leakage. |
| 21 November 1984 | Removed failed core vent fan motor and replaced bearings as well as adjusted mounting and added additional shock absorber material to limit vibration. |
| 26 November 1984 | Removed and reworked failed core vent fan motor and replaced bearings as well as overhauled motor; also reworked mounting to limit vibration. |
| 27 November 1984 | Removed and cleaned cam-operated microswitch on temperature recorder. |
| 30 November 1984 | A-3 Annual Measurement of UFTR Temperature Coefficient of Reactivity. |
| 11 December 1984 | Corrected improper grounding of compensating voltage power supply for the red pen on two-pen recorder. |
| 12 December 1984 | Replaced bent striker on the East Area Monitor. |
| 12 December 1984 | S-2 Annual Reactivity Measurements: Worth of Control Blades. |
| 13 December 1984 | Repaired bent striker on the replacement spare area monitor. |
| 27 December 1984 | S-4 Measurement of Argon-41 Stack Concentration and Measurement of Stack Dilution Air Flow Rate (Previously A-1). |

| Date | Description |
|---|---|
| 27 December 1984 | Q-4/Q-5 Radiological Survey of Unrestricted and Restricted Areas. |
| 28 December 1984 | Q-3 Quarterly Radiological Emergency Drill involving interactions with all outside agencies. |
| 7 January 1985 | Replaced the annex evacuation siren motor with a suitable substitute awaiting arrival of a permanent replacement. |
| 8 January 1985 | S-7 Semiannual Check (Replacement) of Security System Batteries. |
| 10 January 1985 | Replaced all reactor cell ceiling lamps. |
| 16 January 1985 | Q-1 Quarterly Check of Scram Functions. |
| 17 January 1985 | B-1 Biennial Inspection of Incore Reactor Fuel Elements. Both bundles inspected looked to be in good shape. |
| 18 January 1985 | Added ~43 gallons of demineralied water to the shield tank following completion of fuel inspection operations. |
| 21 January 1985 | S-5 Measurement of Control Blade Controlled Insertion Times. |
| 22 January 1985 | A-4 Annual Replacement of Control Blade Clutch Current Light Bulbs. |
| 22 January 1985 | S-5 Measurement of Control Blade Controlled Insertion Times. |
| 22 January 1985 | S-1 Measurement of Control Blade Drop Times. |
| 24 January 1985 | Replaced ink pads on the 12-point temperature recorder. |
| 24 January 1985 | Replaced all three 60 amp fuses on the deep well pump motor. |
| 28 January 1985 | Q-2 Calibration Check of Area and Stack Radiation Monitors. |
| 30 January 1985 | Adjusted slide wire clamp position on temperature recorder to assure proper alarm indication. |
| 11 February 1985 | Completed overhaul of motor on the purple pen of the 2-pen recorder. |

| Date | Description |
|---|---|
| 13 February 1985 | Completed corrective and preventive maintenance on the 2-pen Brush High Speed Recorder used to perform control blade drop time checks. |
| 13 February 1985 | Corrected a jamming problem caused by a protruding screw in the gear mesh system of the purple pen of the two-pen recorder. |
| 16 February 1985 | Checked feasibility of temporarily installing an ammeter to detect recurrence of sticking safety blade (negative determination). |
| 16 February 1985 | Performed visual inspection with the safety blade #3 stuck at ~25% removed to assure sticking blade problem was caused by conditions external to the biological shield. |
| 20 February 1985 | Replaced rupture disk following breakage due to operator error; also added ~45 gallons of demineralized water to the primary coolant storage tank. |
| 26 February 1985 | Disconnected S-3 right angle gear box from drive shaft and disassembled gear boxes and connections. Replaced two faulty bearings and installed modified shim material between the two halves of the clutch housing (aluminum versus cork). Completed overhaul of the S-3 motor, clutch, gearbox assembly and checked proper operation of blade drive system over full span operating conditions. |
| 1 March 1985 | Completed preventive and corrective maintenance on the S-2 right angle blade drive system external to the biological shield. Replaced the same two bearings on the right angle shaft and installed modified shim material between the two halves of the clutch housing. Completed overhaul of the S-2 motor, clutch, gearbox assembly, raised clutch current and checked proper operation of blade drive system over full span of operating conditions. |
| 2 March 1985 | Completed the same preventive maintenance for the S-1 right angle blade drive system as on the S-2 and S-3 systems to include bearing replacement, shim modification and raised clutch current. |
| 2 March 1985 | Completed the same preventive maintenance on the Regulating Blade (RB) as on the Safety Blades to include bearing replacement and installation of modified shim material but no adjustment of the clutch current. |

| Date | Description |
|---|---|
| 2 March 1985 | Completed a final series of tests on all four control blades to include measurement of three full out drop times for each blade, measurement of controlled insertion and removal times for each blade and assuring a successful drop from a series of 5-10 random positions over the full range of removal and verifying all clutch currents. |
| 4 March 1985 | Cleaned and reterminated all power connections and wires on the deep well pump following failure of fuses. Replaced all three (3) 60 amp fuses. |
| 4 March 1985 | Replaced Dilution Fan drive belts and filled bearings with oil. |
| 7 March 1985 | Cleaned contacts on linear recorder. |
| 7 March 1985 | Cleaned contacts on the S-1 blade position indicator following unscheduled shutdown due to position indication going to zero. |
| 7 March 1985 | B-2 Biennial Check to Assure Negative UFTR Void Coefficient of Reactivity. |
| 7 March 1985 | S-2 Annual Reactivity Measurements: Total Excess Reactivity, Reactivity Insertion Rate and Shutdown Margin. |
| 8 March 1985 | Cleaned contacts on back of Safety Blade S-3 position indicator inside control console panel. |
| 9 March 1985 | Overhauled temperature recorder print wheel drive system. |
| 12 March 1985 | Replaced two 12AX7 tubes in the temperature recorder. |
| 13 March 1985 | Q-4/Q-5 Radiological Survey of Unrestricted and Restricted Areas. |
| 19 March 1985 | Added ~20 gallons of demineralized water to the shield tank. |
| 27 March 1985 | Tightened screws in chart feed of temperature recorder. |
| 29 March 1985 | Q-3 Quarterly Radiological Emergency Drill. |
| 29 March 1985 | A-2 UFTR Instrumentation Calibration Check and Calorimetric Heat Balance including partial calorimetric. |

| Date | Description |
|---|---|
| 4 April 1985 | Replaced temporary annex evacuation alarm motor with a series winding motor to assure sufficient alarm decibel level on the intermittant mode of operation. |
| 4 April 1985 | Changed out resins in the demineralizers used for makeup. |
| 9 April 1985 | Q-2 Calibration Check of Area Radiation Monitors. |
| 25 April 1985 | Q-2 Calibration Check of Stack Radiation Monitor. |
| 29 April 1985 | A-2 UFTR Instrumentation Calibration Check and Calorimetric Heal Balance (adjusted the flux control demand set point). |
| 30 April 1985 | A-2 UFTR Instrumentation Calibration Check and Calorimetric Heat Balance (completed the calorimetric heat balance and other adjustments). |
| 7 May 1985 | Q-1 Quarterly Check of Scram Functions. |
| 15 May 1985 | Completed circuit checks for the final drawing of the Vent Diluting Fan Interlock committed to the NRC following the February 11-15, 1985 NRC Inspection finding drawings not finalized. |
| 16 May 1985 | Temporarily switched the leads at the temperature recorder for Thermocouples #9 and #10 (Secondary). |
| 20 May 1985 | Replaced primary coolant demineralizer resins and ceramic filter cartridges. |
| 3 June 1985 | S-4 Measurement of Argon-41 Stack Concentration and Measurement of Dilution Air Flow Rate (Previously A-1). |
| 20 June 1985 | Q-4 Quarterly Radiological Survey of Unrestricted Areas. |
| 20 June 1985 | Replaced all 60 amp fuses on the deep well pump motor and reterminated motor "b" phase. |
| 20 June 1985 | Temporarily raised the S-2 control blade clutch voltage (from 53 to 56 volts) to allow removal following failure to withdraw on demand. Performed successful series of tests including controlled removal time, controlled insertion time, full out drop time and drop from normal operating position. |
| 21 June 1985 | S-1 Measurement of Control Blade Drop Times. |
| 21 June 1985 | S-7 Semi-annual Check (Replacement) of Security System Batteries. |

| Date | Description |
|---|---|
| 24 June 1985 | Repaired broken lead wire within the 2-pen recorder switching mechanism to restore the Pu-Be source alarm annunciation. |
| 25 June 1985 | Replaced the two-pen recorder balance motor for the red pen. |
| 1 July 1985 | Verified withdrawal of S-2 control blade on demand following drop from normal operating position (repeated 2, 8, 16, 22 and 29 July; repeated 5, 12, 22 and 26 August). |
| 1 July 1985 | Cleaned all contacts of red pen on the two-pen recorder. |
| 1 July 1985 | Replaced two contact brushes on the rotary selector switch of the temperature recorder. |
| 1 July 1985 | Cleaned contacts on the S-1 blade position indicator. |
| 2 July 1985 | Q-5 Quarterly Radiological Survey of Restricted Areas. |
| 8 July 1985 | Reterminated phases and replaced fuses, fuse holders and switches in the fuse box on the deep well pump. |
| 10 July 1985 | Replaced selected temperature recorder ink pads. |
| 15 July 1985 | Tightened mounting bolts on the core vent fan motor to reduce vibration. |
| 15 July 1985 | Cleaned contacts on chopper for the red pen of the two-pen recorder. |
| 17 July 1985 | Cleaned all contacts on the two-pen recorder following cessation of operation forcing an unscheduled shutdown. |
| 17 July 1985 | Following a second unscheduled shutdown, replaced a leaking capacitor and inspected all solder joints and runs as well as repaired several connections as causes of the intermittant failure. |
| 19 July 1985 | Installed a new three phase vent fan motor of lower speed and squirrel cage rotor assembly to prevent failures due to excessive vibration. |
| 22 July 1985 | Installed a temporary clamp stop on the vent fan operator housing to prevent excessive motion of the operator to reopen the damper following shutdown of the system. |
| 22 July 1985 | Installed a temporary solid state annex evacuation siren until replacement siren is obtained. |

| Date | Description |
|---|---|
| 22 July 1985 | Replaced worn pulley on the diluting fan. |
| 22 July 1985 | Repaired and overhauled emergency walkie talkies. |
| 23 July 1985 | Q-2 Calibration Check of Area and Stack Monitors. |
| 25 July 1985 | Removed the temporary clamp on vent fan damper and installed the new damper motor/operator assembly. |
| 26 July 1985 | Replaced fuses in the dilutant fan circuit. |
| 30 July 1985 | S-4 Measurement of Argon-41 Stack Concentration. |
| 22 August 1985 | S-5 Measurement of Control Blade Controlled Insertion Times. |
| 22 August 1985 | Added excessive water to the primary coolant storage tank; replaced core vent line filters. |
| 22 August 1985 | Replaced failed flow scram switch in the primary coolant return line caused by connections made during scram checks. |
| 27 August 1985 | Replaced the ±15 volt power supply for the control blade position indicators. |
| 28 August 1985 | Q-1 Quarterly Check of Scram Functions. |

# VI. CHANGES TO TECHNICAL SPECIFICATIONS, STANDARD OPERATING PROCEDURES AND OTHER DOCUMENTS

A. The new Technical Specifications for the UFTR were issued on August 30, 1982 and officially established on September 30, 1982. Two sets of requested corrections/changes to the Technical Specifications were submitted to the NRC during the 1982-1983 reporting period. As noted in the 1983-1984 Annual Report, the UFTR facility received approval for Amendment No. 14 and No. 15 to the UFTR Technical Specifications during that reporting year.

At the end of the 1984-1985 reporting year, no further requests for changes in the approved Tech Specs are expected for the operation of the UFTR with its present high-enriched fuel at a rated power level of 100 kWth. It is expected that another substantive amendment to the Technical Specifications will be required before the UFTR can be converted from utilizing high-enriched MTR plate-type fuel to utilizing low-enriched SPERT pin-type fuel.

B. <u>Revisions to Standard Operating Procedures</u>

All existing UFTR Standard Operating Procedures were reviewed and rewritten into a standard format during the 1982-1983 reporting period as required by a commitment to NRC following an inspection during that year. As committed to NRC, the final approved version of each SOP (except security response procedures which are handled separately) is permanently stored in a word processor to facilitate revisions and updates which are incorporated on a continuing basis.

Table VI-1 contains a complete list of the approved UFTR Standard Operating Procedures at the end of the previous (1983-1984) reporting year. The latest revision number and date for each non-security related procedure is listed in Table VI-1. During the 1984-1985 reporting year, many changes were incorporated into the UFTR Standard Operating Procedures. "Technical Change Notices" were issued to correct minor discrepancies or better express the intent of several procedures to include SOP-O.1, SOP-O.4, SOP-A.6, SOP-B.1 and SOP-C.1.

Fourteen procedures were revised during this reporting year to include O.2, A.1, A.2, A.3, A.4, A.7, B.2, C.1, C.3, D.2, D.3, D.4, E.1 and F.7 as a major administrative effort was devoted to updating all SOPs. In some cases the rewritten revision was simply to standarize format and incorporate several Technical Change Notices. In most cases, there were one or more substantive changes to constitute the revision. All revisions were fully reviewed and approved by the Reactor Safety Review Subcommittee as well as facility administration to assure that the operation of the facility and level of protection of the health and welfare of the public are not compromised. Because of the bulk of these revisions of 14 SOPs (over 150 pages) and the fact that they are fully reviewed to assure no reduction of operational safety margins, these revisions are not incorporated in this Annual Report.

Three (3) new procedures were implemented during the 1984-1985 reporting year. First, in September, 1984 after review by the Reactor Safety Review Subcommittee, UFTR SOP-C.4, "Assembly and Disassembly of Irradiated Fuel Elements" was approved to document the methods previously used on many occasions but never incorporated into a Standard Operating Procedure.

Second, in March, 1985 after review and approval by the RSRS, UFTR SOP-D.4, "10 CFR 50.59 Evaluation anad Determination" was approved to assure proper control of all facility changes and modifications to assure that they do not involve unreviewed safety questions. This 0.4 procedure was developed as the first step in responding to the February 11-15, 1985 NRC inspection following which the UFTR Licensee was cited specifically for failure to adequately control and document a revision to the reactor control circuit when an interlock was installed which provided for a trip of the diluting fan/vent fan on activation of the evacuation alarm, and generally for a failure to adequately implement the guidelines for a Quality Assurance Program as delineated in ANSI Standard N402-1976 referenced in Chapter 17 of the UFTR Safety Analysis Report.

Third, in May, 1985 after review by the RSRS, UFTR SOP-E.7, "Measurement of Temperature Coefficient of Reactivity" was approved to document the set method to be used for official temperature coefficient measurements at the UFTR. Previously such measurements were controlled by less detailed instructions. As these three SOP's (0.4, C.4 and E.7) are all SOP's during this reporting year, the entire text of all three procedures is contained in Appendix B for reference purposes.

Table VI-2 contains a complete listing of the approved UFTR SOPs as of the end of the 1984-1985 reporting year. Again, it is expected that only minor changes will be needed in these SOPs over the next few years. However, a number of completely new procedures continue under development to address the findings of the February NRC inspection and the requirement that procedures be developed to implement the applicable guidelines of ANSI Standard N402-1976, "Quality Assurance Program Requirements for Research Reactors."

C. Revisions to Other Documents.

First, with regard to the Emergency Plan, following notification of NRC approval of the revised UFTR Emergency Plan in a letter dated June 4, 1984, a subsequent update of the Plan was submitted to NRC in a letter dated June 25, 1984. The NRC was then notified in a letter dated September 25, 1984 that the date on which complete implementation of the UFTR Emergency Plan is considered to have occurred is set as September 21, 1984. Since that date implementation is complete and all requirements have been imposed.

Second, with regard to the Security Plan, no violations or deviations were noted during a routine safeguards inspection on June 24-25, 1985 by Region II inspectors. However, as a result of the inspection several minor discrepancies were noted in the Physical Security Plan (PSP). Therefore, in a letter dated July 10, 1985, a proposed Revision 8 of the UFTR Physical Security Plan was transmitted updating quantities of fuel stated to be on hand in several places in the PSP and incorporating the latest versions of all security response procedures. NRC approval and acceptance of this submission as Revision 8 of the UFTR Security Plan was received on July 30, 1985 with only one small portion of a security response procedure deemed inconsistent and hence rejected and required not to be implemented. Since this inconsistency was only the result of NRC interpretation, there is no problem and the inconsistent portion of the Security Response Procedure in question will be rewritten andd submitted to NRC as proposed Revision 9 to the UFTR Physical Security Plan early in the new reporting year. This proposed change was reviewed by the RSRS and actually submitted to NRC in a letter dated September 6, 1985. The Plan is withheld from public disclosure.

By letter dated February 16, 1985 the UFTR facility submitted its new proposed Operator Requalification and Recertification Training Program Plan to replace the one expiring on June 30, 1985. The new program contains a provision to repeat training requirements automatically at two year intervals to eliminate the need to renew the program every two years. Aside from this change, all other changes were minor from the Program in use for the previous two years. In an undated letter received on July 28, 1985, notice was received that the new Operator Requalification and Recertification Training Program Plan was accpeted by NRC. The Program Plan is now being implemented to meet the requirements of 10 CFR 55, Appendix A. This new program is very similar to the previously existing program and is contained in Appendix C for reference purposes.

TABLE VI-1

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(August 31, 1984)

O. Administrative Control Procedures

- 0.1 Operating Document Controls (REV 0, 2/83)
- 0.2 Control of Maintenance (REV 2, 4/83)

A. Routine Operating Procedures

- A.1 Pre-operational Checks (REV 12, 1/83)
- A.2 Reactor Startup (REV 9, 4/83)
- A.3 Reactor Operation at Power (REV 9, 10/82)
- A.4 Reactor Shutdown (REV 8, 10/82)
- A.5 Experiments (REV 3, 4/83)
- A.6 Operation of Secondary Cooling Water (REV 1, 10/82)
- A.7 Determination of Control Blade Integral or Differential Reactivity Worth (REV 0, 3/82)

B. Emergency Procedures

- B.1 Radiological Emergency (REV 3, 4/83)
- B.2 Fire (REV 7, 4/83)
- B.3 Threat to the Reactor Facility (Expanded into F-Series Procedures)
- B.4 Flood (REV 1, 4/83)

C. Fuel Handling Procedures

- C.1 Irradiated Fuel Handling (REV 3, 4/83)
- C.2 Fuel Loading (REV 4, 4/83)
- C.3 Fuel Inventory Procedure (REV 2, 4/83)

D. Radiation Controls Procedures

- D.1 Radiation Protection and Control (REV 3, 4/83)
- D.2 Radiation Work Permit (REV 8, 4/83)
- D.3 Primary Equipment Pit Entry (REV 1, 4/83)
- D.4 Removing Irradiated Samples From UFTR Experimental Ports (REV 2, 4/83)

E. Maintenance Procedures

- E.1 Changing Primary Purification Demineralizer Resins (REV 2, 4/83)
- E.2 Alterations to Reactor Shielding and Graphite Configuration (REV 2, 4/83)
- E.3 Shield Tank and Shield Tank Recirculation System Maintenance (REV 2, 4/83)
- E.4 Withdrawn
- E.5 Withdrawn
- E.6 Argon-41 Concentration Measurement (REV 0, 1/84)

F. Security Plan Response Procedures (Reactor Safeguards Material, Disposition Restricted)

- F.1 Physical Security Controls
- F.2 Bomb Threat
- F.3 Theft of (or Threat of the Theft of) Special Nuclear Material
- F.4 Civil Disorder
- F.5 Fire or Explosion
- F.6 Industrial Sabotage
- F.7 Procedure Controls (Original)

TABLE VI-2

LISTING OF APPROVED UFTR STANDARD OPERATING PROCEDURES
(August 31, 1985)

O. Administrative Control Procedures

- 0.1 Operating Document Controls (REV 0, 2/83)
- 0.2 Control of Maintenance (REV 3, 5/85)
- 0.4 10 CFR 50.59 Evaluation and Determination (REV 0, 3/85)

A. Routine Operating Procedures

- A.1 Pre-operational Checks (REV 13, 6/85)
- A.2 Reactor Startup (REV 11, 5/85)
- A.3 Reactor Operation at Power (REV 10, 5/85)
- A.4 Reactor Shutdown (REV 9, 6/85)
- A.5 Experiments (REV 3, 4/83)
- A.6 Operation of Secondary Cooling Water (REV 1, 10/83)
- A.7 Determination of Control Blade Integral or Differential Reactivity Worth (REV 1, 6/85)

B. Emergency Procedures

- B.1 Radiological Emergency (REV 3, 5/83)
- B.2 Fire (REV 5, 5/85)
- B.3 Threat to the Reactor Facility (Expanded into F-Series Procedures)
- B.4 Flood (REV 1, 4/83)

C. Fuel Handling Procedures

- C.1 Irradiated Fuel Handling (REV 4, 2/85)
- C.2 Fuel Loading (REV 4, 4/83)
- C.3 Fuel Inventory Procedure (REV 3, 2/85)
- C.4 Assembly and Disassembly of Irradiated Fuel Elements (REV 0, 9/84)

D. Radiation Controls Procedures

- D.1 Radiation Protection and Control (REV 3, 1/83)
- D.2 Radiation Work Permit (REV 9, 5/85)
- D.3 Primary Equipment Pit Entry (REV 2, 5/85)
- D.4 Removing Irradiated Samples From UFTR Experimental Ports (REV 3, 5/85)

E. Maintenance Procedures

- E.1 Changing Primary Purification Demineralizer Resins (REV 3, 6/85)
- E.2 Alterations to Reactor Shielding and Graphite Configuration (REV 2, 4/83)
- E.3 Shield Tank and Shield Tank Recirculation System Maintenance (REV 2, 4/83)
- E.4 Superceded
- E.5 Superceded
- E.6 Argon-41 Concentration Measurement (REV 0, 1/84)
- E.7 Measurement of Temperature Coefficient of Reactivity (REV 0, 5/85)

F. Security Plan Response Procedures (Reactor Safeguards Material, Disposition Restricted)

- F.1 Physical Security Controls (Confidential, except for UFTR Form SOP-F.1A)
- F.2 Bomb Threat (Confidential, except for UFTR Form SOP-F.2A)
- F.3 Theft of (or Threat of the Theft of) Special Nuclear Material (Confidential, except for UFTR Form SOP-F.3A)
- F.4 Civil Disorder (Confidential)
- F.5 Fire or Explosion (Confidential)
- F.6 Industrial Sabotage (Confidential)
- F.7 Security Procedure Controls (REV 1, 9/84)

## VII. RADIOACTIVE RELEASES AND ENVIRONMENTAL SURVEILLANCE

This chapter summarizes the gaseous, liquid and solid radioactive releases from the UFTR facility for this reporting year. Argon-41 is the primary gaseous release while there was no measureable liquid release and no solid release at all. Finally, this chapter includes a summary of personnel exposures at the UFTR facility.

### A. Gaseous (Argon-41)

The gaseous releases from the UFTR Facility for this reporting year are summarized in Table I. The basis for the gaseous activity release values is indicated in Table II. These values are obtained by periodic measurements of stack concentrations as required by Technical Specifications.

TABLE I

UFTR GASEOUS RELEASE SUMMARY

| Month | Release | Average Monthly Concentration |
|---|---|---|
| September, 1984 | $9.45 \times 10^{6}$ μCi/Month | $3.33 \times 10^{-9}$ μCi/ml |
| October, 1984 | $9.49 \times 10^{6}$ μCi/Month | $3.34 \times 10^{-9}$ μCi/ml |
| November, 1984 | $1.14 \times 10^{7}$ μCi/Month | $4.01 \times 10^{-9}$ μCi/ml |
| December, 1984 | $7.10 \times 10^{6}$ μCi/Month | $2.54 \times 10^{-9}$ μCi/ml |
| January, 1985 | $8.18 \times 10^{6}$ μCi/Month | $2.92 \times 10^{-9}$ μCi/ml |
| February, 1985 | $0.00 \times 10^{6}$ μCi/Month | $0.00 \times 10^{-9}$ μCi/ml |
| March, 1985 | $1.33 \times 10^{7}$ μCi/Month | $4.77 \times 10^{-9}$ μCi/ml |
| April, 1985 | $1.93 \times 10^{7}$ μCi/Month | $6.73 \times 10^{-9}$ μCi/ml |
| May, 1985 | $1.14 \times 10^{7}$ μCi/Month | $4.09 \times 10^{-9}$ μCi/ml |
| June, 1985 | $1.76 \times 10^{7}$ μCi/Month | $6.27 \times 10^{-9}$ μCi/ml |
| July, 1985 | $2.51 \times 10^{7}$ μCi/Month | $8.96 \times 10^{-9}$ μCi/ml |
| August, 1985 | $9.92 \times 10^{6}$ μCi/Month | $3.47 \times 10^{-9}$ μCi/ml |

TOTAL ARGON-41 Releases.............................. 142.2 Ci
AVERAGE ARGON-41 Release Concentration....... $4.20 \times 10^{-9}$ μCi/ml

UFTR Technical Specifications require average Argon-41 release concentration averaged over a month to be less than $4.0 \times 10^{-8}$ μCi/ml. Total releases and average monthly concentrations are based upon periodic Argon-41 release concentration measurements made at equilibrium full power (100 Kw) conditions. The results for these experimental measurements used in calculating the gaseous Ar-41 release data are summarized in Table II.

TABLE II

UFTR GASEOUS RELEASE DATA BASE

| Months | Releases Per Unit Energy Generation | Instantaneous Argon-41 Concentration at Full Power |
|---|---|---|
| Sept. '84 - Dec. '84 | 3740.9 μCi/Kw-hr | $9.49 \times 10^{-8}$ μCi/ml |
| Dec. '84 - May '85 | 3496.8 μCi/kw-hr | $9.00 \times 10^{-8}$ μCi/ml |
| June '85 | 5674.6 μCi/kw-hr | $14.59 \times 10^{-8}$ μCi/ml |
| July '85 - Aug '85 | 5144.2 μCi/kw-hr | $13.24 \times 10^{-8}$ μCi/ml |

B. Liquid Waste from the UFTR/Nuclear Sciences Complex

There were approximately 64,100 liters discharged from the liquid waste holdup tanks to the campus sanitary sewage system during this reporting period. For this period there was only one single batch discharge as summarized here:

| Month | Volume (liters) | Concentrations (μCi/ml) |
|---|---|---|
| February, 1985 | 64,100 | NDA |

NDA denotes no detectable activity where the minimum detectable activity (MDA) is $3.5 \times 10^{-9}$ μCi/ml.

The effluent discharged into the holding tanks comes from twenty laboratories within the Nuclear Sciences Center as well as the UFTR complex. The UFTR normally releases approximately 1 liter of primary coolant per week to the holding tank as waste from primary coolant sampling. The average activity for this coolant was $2.00 \times 10^{-7}$ μCi/ml ($\beta - \gamma$) and $1.6 \times 10^{-8}$ μCi/ml ($\alpha$) for this 1984-1985 annual reporting period.

C. Environmental Monitoring

The UFTR maintains film badge as well as thermoluminescent dosimeter monitoring (new for the 1982-1983 reporting period) in areas adjacent to and in the vicinity of the UFTR complex. The badge and TLD cummulative totals for this reporting period from September 1984 through August 1985 are summarized in Table III.

TABLE III

CUMMULATIVE RESULTS OF ENVIRONMENTAL MONITORING

FOR THE 1984-1985 REPORTING YEAR

| Film Badge Designation | Total Yearly Exposure (mrem)[1] | TLDs[2] | Total Yearly Exposure (mrem)[1] |
|---|---|---|---|
| A1 | M | 1 | M |
| A2 | 40 | 2 | M |
| A3 | M | 3 | M |
| A4 | M | 4 | M |
| A5 | M | 5 | M |
| A6 | M | 6 | M |
| A7 | M | 7 | M |
| | | 8 | M |
| | | 9 | M |
| | | 10 | M |
| | | 11 | M |
| | | 12 | M |

Note 1: M denotes minimal (<10 mrem) meaning background only.

Note 2: The first seven TLDs are attached adjacent to the corresponding numbered film badge monitors.

D. Personal Radiation Exposure

The maintenance work to replace all six (6) thermocouples and provide new terminated connections in the core coolant exit lines necessitated higher facility personnel exposures than in most years. In all cases workers and work were controlled using Radiation Work Permits to ensure adequate monitoring of whole body as well as extremity doses using dosimters as well as badges with redundant dosimeters and TLD badges to assure adequate records. UFTR-associated personnel exposures significantly greater than minimum detectable during the reporting period are summarized in the following two tables.

Table IV lists monthly permanent badge exposures recorded above background. Table V lists results of ring and other specialized badges utilized to record dose, especially to the extremities, during the thermocouple replacement and retermination project.

For visitors, students, or other non-permanent UFTR personnel, no individual had a non-zero dosimeter exposure measurement above 10% allowable for this reporting period. In most cases, the values of one or two mrem recorded dosimeter exposures are probably due to uncertainty in reading the devices.

TABLE IV

PERMANENT BADGE EXPOSURE REPORTED ABOVE BACKGROUND

| | | |
|---|---|---|
| September, 1984 | | |
| P.M. Whaley | 10 mRem | deep/whole body |
| G.W. Fogle | 30 mRem | deep/whole body |
| October, 1984 | | |
| P.M. Whaley | 340 mRem | deep/whole body |
| C.J. Stiehl | 180 mRem | deep/whole body |
| H. Gogun | 120 mRem | deep/whole body |
| November, 1984 | | |
| P.M. Whaley | 20 mRem | fast neutron |
| January, 1985 | | |
| H. Gogun | 10 mRem | deep/whole body |
| G.W. Fogle | 10 mRem | deep/whole body |
| February, 1985 | | |
| H. Gogun | 10 mRem | deep/whole body |
| P.M. Whaley | 10 mRem | deep/whole body |
| March, 1985 | | |
| C.J. Stiehl | 10 mRem | deep/whole body |
| May, 1985 | | |
| P.M. Whaley | 20 mRem | deep/whole body |
| W.G. Vernetson | 130 mRem | fast neutron* |

*NOTE: During the month of May when the 130 mRem fast neutron exposure was recorded for Dr. Vernetson, he was involved in no activities which could have produced this dose. Therefore, it is assumed that this recorded dose was due to some error in reading the badge. This is especially true since Dr. Vernetson was certainly not exposed to fast neutrons and there was no other dose recorded.

TABLE V

SPECIALIZED TLD BADGE READINGS RECORDED DURING

THE THERMOCOUPLE REPLACEMENT PROJECT

| Name | Date | TLD Badge No. | Badge Location | Radiation Dose (mRem) |
|---|---|---|---|---|
| H. Gogun | 5 Oct 84 | R-1 | Left Wrist | 313 |
| H. Gogun | 5 Oct 84 | R-2 | Right Wrist | 863 |
| H. Gogun | 5 Oct 84 | R-3 | Forehead | 161 |
| H. Gogun | 5 Oct 84 | R-4 | Right Ankle | 91 |
| H. Gogun | 5 Oct 84 | R-5 | Whole Body (Chest) | 78.6 |
| P.M. Whaley | 5 Oct 84 | R-6 | Forehead | 136 |
| P.M. Whaley | 5 Oct 84 | R-7 | Left Hand | 430 |
| P.M. Whaley | 5 Oct 84 | R-8 | Right Hand | 499 |
| C.J. Stiehl | 5 Oct 84 | R-9 | Forehead | 76 |
| C.J. Stiehl | 5 Oct 84 | R-10 | Right Hand | 308 |
| H. Gogun | 5 Oct 84 | A | Left Hand | 727 |
| H. Gogun | 5 Oct 84 | B | Right Hand | 1976 |
| C.J. Stiehl | 5 Oct 84 | C | Left Hand | 657 |
| C.J. Stiehl | 5 Oct 84 | D | Right Hand | 588 |
| P.M. Whaley | 8 Oct 84 | R-1 | Left Wrist | 237 |
| P.M. Whaley | 8 Oct 84 | R-2 | Right Wrist | 196 |
| P.M. Whaley | 8 Oct 84 | R-3 | Forehead | 86 |
| P.M. Whaley | 8 Oct 84 | R-4 | Whole Body (Chest) | 72 |
| P.M. Whaley | 8 Oct 84 | R-5 | Right Ankle | 193 |
| P.M. Whaley | 8 Oct 84 | E | Left Hand | 669 |
| P.M. Whaley | 8 Oct 84 | F | Right Hand | 830 |

## VIII. EDUCATION, RESEARCH AND TRAINING UTILIZATION

NOTE: The participating students are indicated with an *. Other participants are faculty or staff members of the University of Florida, unless specifically designated otherwise. A ** indicates those students working on theses or dissertations.

NAA Research - Elemental Analysis of Silver Diffusion in Glass Slides, Dr. V. Ramaswamy, I. Najafi**, G. Welch*.

In analyzing and evaluating a novel electrolytic process involving ion-exchanged waveguides for small signal processing applications, it becomes necessary to measure the profile of silver diffused in glass slides and also to determine the elemental composition of the glass slide. Therefore, NAA is being applied for short and long irradiation intervals and the activity of the slides measured afterwards. This work has proceeded well. Slides have been activated, thin layers removed and the activity remeasured due to key elements such as the diffused silver. This last step of layer removal is repeated until no silver is detected. This work is producing good results to date and is expected to continue with periodic usage of the UFTR.

NAA Research - Neutron Activation Analysis of Seagrass Community Components - Dr. G. Chiu (UWF), Dr. Ranga Rao (UWF), Dr. W.G. Vernetson, D. Morton* (UWF), L. Hung*, S. Kahook*, Reactor Staff.

Various seagrass communities have been exposed to used drilling fluids off the gulf coast of northwest Florida. The components of one of these communities consisting of sediments, water samples, grasses, shells and shellfish meats have been subjected to long and short irradiations to monitor the uptake of certain heavy metals, principally barium and chromium, both of which are suitable for detection using neutron activation analysis. Reactor time for this work is supported under the DOE Reactor Sharing Program. Results to date are encouraging and work is continuing.

NAA Research - Neutron Activation Analysis of Estuary Sediments - Dr. R. Byrne (USF-St. Petersburg), Dr. G. Smith (USF-St. Petersburg), S. Kahook*, Reactor Staff.

Under the DOE Reactor Sharing Grant, Instrumental Neutron Activation Analysis will be applied to estuary sediments from the Tampa Bay reegion of Florida to determine and quantify the spatial distribution of various rare earth metals. Work to date has been restricted to preparatory work as well as an exercise mapping the spatial variation of the flux in the UFTR vertical ports and another exercise to determine accurate values for the cadmium ratios for ports to be used in the activations for this research. These are key parameters because of the resonance absorption characteristics of many rare earth metals. The NAA work on this project is expected to begin in the upcoming reporting year as sample preparations are now completed and a new sample holder to hold multiple samples in the UFTR center vertical port core region has been manufactured. In addition, virgin teflon tube sample holders have been demonstrated to withstand extended reactor runs and have been analyzed for impurity content using NAA.

NAA Research - Neutron Activation Analysis of Hogtown Creek Samples - Dr. W.G. Vernetson, P.M. Whaley, J. Carswell**, S. Kahook*, Reactor Staff.

Hogtown Creek flowing through Gainesville is subject to various pollution sources. Neutron Activation Analysis is being applied to evaluate and quantify the presence of certain suspected elemental pollution indicators (chlorine, copper and chromium) at various points in the Hogtown Creek flow system. NAA is being performed on water samples as well as selected soil and plant samples at various stages in the creek's drainage system. Results to date do show elevated levels of some elemental indicators, especially chromium but this work is incomplete. Additional work will be required to determine the source of the contamination after quantification. Work to date formed the basis for training a high school student in research methods under the 1984 Florida Foundation of Future Scientists summer high school student research program. The results obtained to date were presented as a science fair project which reached the state regional finals.

NAA Research - Neutron Activation Analysis of Marine Sediments - Dr. J.H. Trefry, S. Metz*, R. Trocine*, Dr. W.G. Vernetson, Reactor Staff.

Under the DOE Reactor Sharing Grant, instrumental neutron activation analysis is being applied to marine sediments from the Gulf of Mexico and the Florida Atlantic Coast to obtain the spatial distribution of selected metals. Results of the work conducted at the UFTR facility under the Reactor Sharing Program are encouraging and the work is expected to continue with journal publications to follow at intervals.

NAA Research - Comparative Analysis of Zinc Content In Human Hair, Dr. W.G. Vernetson, M. Adams*, P.M. Whaley, S. Kahook*.

Various human hair samples were irradiated for neutron activation analysis and referenced to NBS standards. The same human hair was also analyzed using another method, atomic absorption spectroscopy. This project involved a comparative evaluation of the two methods of trace element analysis to determine which would be most advantageous for such human hair evaluations. Work to date formed the basis for training a high school student in research methods under the 1985 Florida Foundation of Future Scientists summer high school student research program. The results to date were presented at the Summer FFFS sessions and are good enough to be invited to be presented at the 1986 Junior Science, Engineering, and Humanities Symposium.

NAA Research - Neutron Activation Analysis of a Seagrass Bed Exposed to Drilling Fluids, Dr. C.N. D'Asaro (UWF), Dr. T. Duke (UWF), R. Montgomery** (UWF), S. Macauley* (UWF), D. Morton* (UWF), S. Kahook*, L. Hung*, Reactor Staff.

This project involves moving cores from a seagrass bed to the laboratory where they are exposed to various drilling fluids to determine possible effects on seagrass community structure and biomass. Barium and chromium are present in the drilling fluids and are known to impact negatively on animals and plants. However, knowing the correct concentrations of these metals is critical in order to correlate observed effects with metal concentrations to explain the phenomena involved. Use of the UFTR facility for the irradiation and subsequent NAA provides an effective means of performing the chemical analyses.

NAA Research - Neutron Activation Analysis of Various Treated and Untreated Water Sources, Dr. K. Williams, Dr. W.G. Vernetson, Z. Molosevick*, S. Kahook*, Reactor Staff.

Neutron activation analysis of various treated and untreated water sources was undertaken as part of a radiochemistry laboratory course. A more careful analysis of city water, well water and various other demineralized and otherwise purified water sources will be undertaken as this work is continued periodically. The objective will be to quantify trace element contaminants in these water sources for general usage in chemical analysis.

NAA Research - Trace Element Analysis of Human Blood Serum and Bone Marrow Samples, Dr. G.S. Roessler, Dr. W.E. Bolch.

Blood and serum samples have been analyzed for trace element concentrations from sick as well as healthy patients relative to Leukemia. Results have also been compared with standards. The objective is to correlate trace element concentrations (high or low) with certain diseases. The initial project in this series has been completed and a proposal was submitted to support continuing work during the last reporting year; future studies in this area are planned with the level of effort dependent on response to the proposal.

NAA Research - Analysis of Hair Samples for Trace Elements, Dr. G.S. Roessler, Dr. W.G. Vernetson, P.M. Whaley, L. Hung*, S. Kahook*.

Human hair samples are irradiated for various time periods. The activated samples are then spectral analyzed using minicomputer methodology to determine and identify abnormal and elemental composition. Following several irradiations as part of a laboratory experiment and demonstration of neutron activation analysis techniques, this project has been proceeding at a very slow pace awaiting additional funding based on development of better analytical and experimental techniques.

UFTR Core Redesign (LEU Program) - Neutronics Analysis for UFTR Core Redesign - Dr. E.T. Dugan, Dr. W.G. Vernetson, Dr. N.J. Diaz, P.M. Whaley, S. Baker.

As part of the DOE Low Enriched Uranium Conversion Program, investigations have been performed on the UFTR to determine the feasibility and desirability of replac-ing the 93% enriched MTR plate type fuel with 4.8% enriched, cylindrical SPERT fuel pins. For this redesign, the only permanent structural modification is the insertion of new grid assemblies into existing fuel boxes. Acceptable neutronic criteria (Possible $k_{eff}$ range, maximum flux and degree of undermoderation) have been determined using industry-accepted, 4-group cross sections in one, two and three-dimensional diffusion theory calculations of $k_{eff}$, flux profiles, power peaking factors and coefficients of reactivity. First order perturbation calculations have been used to determine key kinetic parameters. Neutronic results to date indicate that the UFTR/SPERT core redesign can be accommodated to meet requisite neutronic criteria with an actual increase in peak thermal flux levels which will be very useful for NAA and other research projects requiring high thermal flux levels.

UFTR Core Redesign (LEU Program) - Thermal-hydraulic Analysis for Core Redesign - Dr. E.T. Dugan, Dr. W.G. Vernetson, Dr. N.J. Diaz.

As part of the DOE LEU Conversion Program, thermal-hydraulic analysis related to redesign of the UFTR core using SPERT fuel rods has been performed. Computer analysis has been undertaken to evaluate the UFTR/SPERT design for steady-state conditions as well as transients arising in response to a step insertion of reactivity, a loss of coolant flow, and a loss-of-coolant accident. Results to date indicate required safety margins and transient response conditions can be maintained with the UFTR/SPERT core design.

UFTR Transient Analysis - Implementation of DSNP Program Language to Analyze UFTR Operational Transients - Dr. E.T. Dugan, Dr. W.G. Vernetson, J. Samuels**.

The Dynamic Simulator for Nuclear Power (DSNP) Plants programming language is being implemented to analyze selected UFTR heat up and cooldown transients. Results from DSNP calculations are being compared and evaluated relative to existing and new transient UFTR output recorded on various output devices. This analysis will serve as a teaching aid for the DSNP programming language and will hopefully allow fast-running analysis of UFTR transients for class exercises and other similar applications within the Nuclear Engineering Sciences Department.

UFTR Reactor Operations and NAA Lab Exercises - Dr. W.G. Vernetson, G. Stephenson/R. Rawls (CFCC), Dr. M. Lombardi/D. Fricks (HCC), Dr. S. Marchionno (SFCC), P.M. Whaley, S. Kahook*, Reactor Staff.

Mini-courses have been developed and presented as part of the UFTR DOE Reactor Sharing Program to provide practical reactor operations and health physics training as well as NAA laboratory experience for groups of students from Central Florida Community College Radiation Protection Technology program, Santa Fe Community College Nuclear Medicine Technology/Radiologic programs and the Hillsborough Community College Nuclear Medicine/Allied Health Technology programs.

Cerenkov Noise Detector Development - Development of a Detector of Reactor Core Perturbations - Dr. E.E. Carroll, Prof. G.J. Schoessow, H. Carvajal**, C. Levy*, N. Yunessi*, D. Lin*, Reactor Staff.

A new design Cerenkov detector is being developed and tested using the prompt-gamma radiation deriving from the reactor core. The detector is being located in the thermal column entrance port with shielding plugs removed and substituted by lithiated paraffin plugs made for the purpose of reducing the neutron flux to acceptable values when the reactor is running at power. Samples of these lithiated paraffin plugs were irradiated to assure that no unexpected activation products would be formed were the plugs to see a large flux. Other work has involved spectroscopic analysis of the gamma energies emitted from the thermal column where the detector will be placed. The Cerenkov detector has been moved at various angles for various power levels with the ultimate objective to develop a detector system that is able to detect reactor perturbations at various power levels through large thicknesses of material by means of high-energy, penetrating, fission-produced gamma rays. The work to date has produced a doctoral dissertation and results are encouraging.

Reactor Physics - Determination of Relative Flux Profiles In Several UFTR Ports, Dr. W.G. Vernetson, P. Sakornsin*, P.M. Whaley, S. Kahook*.

Several UFTR ports for which currently accurate flux profiles were not available were mapped using bare and cadmium covered foils. The results of this work are of interest because of a research project scheduled to use the mapped ports in the near future for NAA of rare earth samples. This work formed the basis for training a high school student in research methods under the 1985 Florida Foundation of Future Scientists summer high school student research program.

Optical Physics Research - Analysis of Thermal Neutron Induced Lattice Disturbances in Dielectric Materials, Dr. H. Plendl (FSU), Dr. P. Gielisse (FSU), J. Rink* (FSU).

Various types and cuts of dielectric materials, primarily topaz, have been subjected to various thermal neutron fluences in the UFTR. The objective of this work is to analyze the response of the material lattice to the disturbances caused by the various components of the radiation field to include thermal neutrons, fast neutrons and gamma rays. Comparisons are being made with previous results of irradiations with x-rays and electrons and with thermal neutrons, all in isolation. The purpose of the work is to gain a comprehensive understanding of how certain dielectrics such as $Al_2(SO_4)(OH)$ and similar lattices respond to different types of radiation in the generation and destruction of color sites.

Optical Physics Research - Dr. P. Gielisse, LTE Ltd.

Various types and cuts of Topaz dielectric material are being subjected to relatively high fluence in the UFTR and to a pure Co-60 source. The objective is to provide predictive explanations of how and why color centers are generated, why some are more lasting than others, and hopefully how to use basic physics of irradiations to enhance and conserve selected color centers.

UFTR Risk Assessment - Dr. W.G. Vernetson, R. Griffith*.

A preliminary probabilistic risk assessment of the University of Florida Training Reactor has been conducted. This project has determined an estimate of the probability of occurrence of a set of postulated maximum credible UFTR accidents. The results will be used to show that the UFTR poses no significant risk to the general population and environment around the UFTR and has demonstrated proficiency in PRA analyses as additional PRA projects are undertaken. Specifically, research is continuing to obtain better data for the maximum credible accidents and extend the methodology to examine risk associated with less serious but higher probability UFTR-related accidents. This project is active on a reduced level at present.

UFTR Operator Training and Requalification - Dr. W.G. Vernetson, Reactor Staff.

Lectures and hands-on operations on the reactor are necessary to license operators for the UFTR. The requalification program establishes a required number of startups, weekly checks, daily checks, drills, practical exercises and lectures for each operator. Operator participation is mandatory in order to maintain assurance of proficiency levels and to be able to demonstrate the requisite operator skills. Operation proficiency is assured by written and oral tests as well as observed practice exercises.

Utility Operator Training - Hot License SRO Candidate Training for Florida Power Corporation, Dr. W.G. Vernetson, M. Penovich (FPC), P.M. Whaley, Reactor Staff.

A correlated set of ten reactor operations exercises was conducted at the UFTR console for two (2) degreed FPC personnel preparing for the SRO examination. This abbreviated program is only conducted for degreed SRO condidates and assures each trainee of the requisite 10 startups and 10 shutdowns during the course of an intensive 20 hour (2-3 days) training course. All records are maintained permanently and were also supplied to FPC to support the licensing of these two SRO candidates.

Utility Operator Training - Hot License Candidate Reactor Operator Training for Florida Power Corporation, Dr. W.G. Vernetson, M. Penovich (FPC), P.M. Whaley, G. Welch*, Reactor Staff.

A three week intensive course consisting of a correlated set of lectures, reactor operations exercises and hands-on practice at the UFTR console is utilized as one of the training segments in the licensing of reactor operators for the FPC Crystal River 3 nuclear power plant. All trainees receive credit for performing a minimum of 10 startups and 10 shutdowns of the UFTR during the course. All records are maintained permanently and were also supplied to FPC to support the licensing effort.

Reactor Operations Course Instruction and Demonstrations

| Course | Instructor |
|---|---|
| ENU-3002 | Dr. R.T. Schneider |
| ENU-4104 | Dr. A.M. Jacobs |
| ENV-4201/5206 | Dr. C.E. Roessler |
| ENV-4241 | Dr. C.E. Roessler |
| ENU-5005 | Dr. R. Pagano |
| ENU-5005 | Dr. A.M. Jacobs |
| CHS-5110L | Dr. K. Williams |
| ENV-6211 | Dr. C.E. Roessler |
| ENV-6211L | Dr. W.E. Properzio |

NAA Research - Rabbit System Remote Handling Facility Development and Implementation - Dr. G.S. Roessler, Dr. W.G. Vernetson, Reactor Staff.

Radiation and contamination surveys are performed in the radiochemistry laboratory where the new NAA Instrumentation and Counting Facility has been utilized. Periodic checkouts are conducted of the "Rabbit" facility to assure efficient rapid transfer for remote sample insertion and removal from the UFTR core region especially when new rabbit capsules are first utilized. To handle the sample volume more efficiently for Neutron Activation Analysis, efforts are currently directed to obtaining and implementing a better computer-based analyzer system.

Gaseous Release Determinations - Argon-41 Stack Measurements - Dr. W.G. Vernetson, Dr. W.E. Bolch, P.M. Whaley*, Reactor Staff.

A cobalt-60 Standard Sample has been applied in standardized controlled measurements of radioactivity (Ar-41) in stack effluent. A direct detailed standard operating procedure (UFTR-SOP-E.6: Argon-41 Concentration Measurement) has been developed and approved as the best practicable evaluation of Ar-41 releases from the UFTR facility as required by UFTR Technical Specification on Effluents Surveillance in Section 4.2.4, Paragraph (2). Application of this SOP continues to obtain a statistically significant number of data points and eventually to investigate the effect of variable core vent flow on total Ar-41 releases. Other commitments during this reporting year have limited progress on this project.

Nuclear Engineering Laboratory I - (ENU-4505L) - Dr. E.E. Carroll, Jr., Reactor Staff.

ENU-4505L is the nuclear engineering laboratory for undergraduate senior level students in Nuclear Engineering Sciences. The UFTR is used for a variety of exercises and experiments, including radiation dose measurements, measurement of induced radioactivity and reactor physics parameters as well as operational measurements.

Nuclear Engineering Laboratory II - (ENU-6516L) - Dr. J. Cox, Reactor Staff.

ENU-6516L is the main laboratory course for Nuclear Engineering graduate students. It involves radiation and reactor-related measurements and experimentation on a more advanced level than ENU-4505L particularly in applying computers for acquisition of data and subsequent analysis of that data as part of the laboratory report requirements. During the current year one project in this course involved development of a pile oscillator with which preliminary core characteristics were determined with followup planned the next time this course is taught.

Reactor Operations Laboratory (ENU-4905/6937L) - Dr. Vernetson, Reactor Staff.

Students of the Reactor Operations Lab spent about three (3) hours weekly at the controls of the UFTR performing reactor operations under supervision of licensed reactor operators. The lab encompasses training in reactivity manipulations, reactor checkouts, operating procedures, standard and abnormal operations and all applicable regulations. Specific exercises directed toward development of understanding of light water power reactor behavior are included as this laboratory course serves as basic preparation for students entering the utility industry in the test and startup as well as plant operations areas. When this course is not interrupted by outages, students perform a series of exercises designed to assure them of conducting 10 startups and 10 shutdowns. A special effort is made to correlate UFTR exercises with various aspects of LWR operations.

Reactor Operations - (ENU-5176L) - Dr. E.T. Dugan, Dr. W.G. Vernetson, Reactor Staff.

Students in the reactor operations course spend about two hours weekly at the controls of the UFTR performing reactor operations under supervision of licensed reactor operators. The lab encompasses training in reactivity manipulations, reactor checkouts, operating procedures, standard and abnormal operations and all applicable regulations. Specific exercises directed toward development of understanding of light water power reactor behavior are included as this laboratory course serves as basic preparation for students entering the utility industry in the test and startup area as well as plant operations. A special effort is made to correlate UFTR exercises with the classroom lectures on various aspects of LWR operations. This course was not offered during the current reporting year.

Radiation Protection Training - Reactor Operations Based Radiation Protection Health Physics Cooperative Work Training Program, Dr. W.G. Vernetson, G. Stephenson (CFCC), R. Rawls (CFCC), Reactor Staff.

A set of reactor operations based radiation protection health physics cooperative work training exercises have been developed to meet the cooperative work needs of Radiation Protection Technology students at Central Florida Community College (CFCC). Two of these courses were conducted during this reporting year with great success. Students who take these courses are well suited to work as radiation control technicians and health physics assistants at nuclear power plants. The exercises are also extremely adaptable and some of them have been upgraded and used in the graduate health physics laboratory course at the University of Florida. The development of this course and its subsequent presentation to CFCC students has been partially supported under the UFTR DOE Reactor Sharing Program and has been a valuable resource in the effort to increase reactor utilization.

Radiation Protection and Control Health Physics Field Exercises - (ENV-6211L) - Dr. C.E. Roessler, Dr. W.E. Properzio, D. Munroe, H. Norton, M. DesRoches, Reactor Staff.

This course provides students in various disciplines with practical experience in radiation protection and control such as performing radiation surveys in and around the UFTR cell and environs, calibrating area radiation monitors, etc. These exercises also serve as training for radiation control technicians.

## IX. THESES, PUBLICATIONS, REPORTS AND ORAL PRESENTATIONS OF WORK RELATED TO THE USE AND OPERATION OF THE UFTR

1. "Out-of-Core Gaseous Cerenkov Detector for Reactor Noise Analysis," H. Carvajal-Osorio and E.E. Carroll, Trans. Amer. Nucl. Soc., 47, p. 427, November, 1984.

2. "Reactor Operations Training Program Manual for Florida Power Corporation SRO Candidates," W.G. Vernetson, November, 1984.

3. "Annual Progress Report of the University of Florida Training Reactor for September 1, 1983 - August 31, 1984 Reporting Year," W.G. Vernetson, November, 1984.

4. "Ion-Exchanged Waveguides for Small Signal Processing Applications - A Novel Electrolytic Process," V. Ramaswamy and I. Najafi, proposal submitted to various agencies, September - December, 1984.

5. "Nuclear Reactor Operations Training Manual for Florida Power Corporation Hot License Reactor Operator Candidates," W.G. Vernetson, December, 1984.

6. "Effects of Drilling Fluids on an Experimental Seagrass (Thalassia testudinum) Community: Potential for Bioaccummulaton of Barium and Chromium," Dana Morton, Masters' Thesis in Biology Department, University of West Florida, Pensacola, degree expected December, 1985*.

7. "Summary and Certification Report for the Florida Power SRO Reactor Operations Training Program Conducted November 27-29, 1984," Nuclear Facilities Division, University of Florida, January 4, 1985.

8. "Winter Semester Reactor Operations Laboratory Manual for ENU-4905/6937L," W.G. Vernetson, January, 1985.

9. "Summary Evaluation Report of the Florida Power Corporation Reactor Operations Training Program Conducted December 3 - December 21, 1984," Nuclear Facilities Division, University of Florida, February 15, 1985.

10. "Application of Neutron Activation Analysis to Determine the Concentration of Copper, Chromium and Chlorine in Environmental Samples," John E. Carswell, Science Fair Project based on work as participant in summer, 1984 Florida Foundation of Future Scientists research program, Nuclear Facilities Division, University of Florida, February, 1985.

11. "University of Florida Reactor Sharing Program," W.G. Vernetson, proposal submitted to Department of Energy, March, 1985.

12. "A Neutronics Study of the Core Conversion From HEU to LEU Fuel For the University of Florida Training Reactor (UFTR)," R. Scott Baker, paper presented at the Eastern Regional Nuclear Science and Engineering Student Conference, University of Florida, April 4-7, 1985.

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* It is expected that the results of this work will be published in a journal article at a future date under Dr. Ranga Rao, Biology Department, University of West Florida, Pensacola.

13. "Control Blade Maintenance Experience at the University of Florida Training Reactor," P.M. Whaley, paper presented at the Eastern Regional Nuclear Science and Engineering Student Conference University of Florida, April 4-7, 1985.

14. "Final Report on the Spring Semester Reactor Operations-Based Health Physics Cooperative Work Training Program," conducted for Radiation Protection Technology Program Students at Central Florida Community College, W.G. Vernetson, April, 1985.

15. "Development of an Out-of-Core Cerenkov Radiation Detector for Nuclear Reactor Diagnostics," H. Carvajal-Osorio, Doctoral Dissertation in Nuclear Engineering Sciences Department, University of Florida, May, 1985.

16. "Spring Semester Reactor Operations Laboratory Manual for ENU-4905/6937L," W.G. Vernetson, May, 1985.

17. "A Reactor Operations Based Radiation Protection Health Physics Laboratory," W.G. Vernetson, Trans. Amer. Nucl. Soc., 49, p. 33, June, 1985.

18. "Comparative Methods of Composition Determination," M. Adams, summer research project report submitted as a participant in Florida Foundation of Future Scientists 1985 Summer Research Program (prepared also for use as a High School Science Fair Project), Nuclear Facilities Division, University of Florida, August 5, 1985.

19. "Determination of Thermal Neutron Flux in Special Experiments Using Gold Foils at the University of Florida Training Reactor," P.C. Sakornsin, summer research project report submitted as a participant in Florida Foundation of Future Scientists 1985 Summer Research Program (prepared also for use as a High School Science Fair Project), Nuclear Facilities Division, University of Florida, August 6, 1985.

20. "Expanded Scope of Training and Education Programs at the University of Florida Training Reactor," W.G. Vernetson and P.M. Whaley, ROD Topical Meeting, Trans. Amer. Nucl. Soc., 49, (Suppl. 2), p. 36, August, 1985.

21. "Final Report on the Summer Semester Reactor Operations-Based Health Physics Cooperative Work Training Program," conducted for Radiation Protection Technology Program Students at Central Florida Community College, W.G. Vernetson, August, 1985.

22. "Implementation of DSNP (Dynamic Simulator of Nuclear Plants) and Application to the Analysis of Transients for the UFTR," J. Samuels, Masters' Thesis Project in Nuclear Engineering Sciences Department, University of Florida, degree expected May, 1986.

23. "Physical Basis of Heat and Radiation-Induced Color Changes in Topaz: $AL_2(SiO_4)(OH,F)_2$," J. Rink, Masters' Thesis in Physics Department, Florida State University, degree expected May, 1986.

24. "Determination of Parameters for a UFTR Primary Coolant Fission Product Activity Model," R. Knecht, Masters' Thesis Project in Environmental Engineering Sciences Department, University of Florida, degree expected August, 1986.

APPENDIX A

UFTR FACILITY LICENSEE RESPONSE TO

NRC INSPECTION REPORT

NUMBER 50-83/85-01

NILS J. DIAZ, DIRECTOR
W.G. VERNETSON, REACTOR MANAGER
NUCLEAR REACTOR BUILDING
GAINESVILLE, FLORIDA 32611
PHONE (904) 392-1429 TELEX 56330

# NUCLEAR FACILITIES DIVISION

## UNIVERSITY OF FLORIDA

March 26, 1985

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Attention: J. Nelson Grace
Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

Pursuant to the reporting requirements of paragraph 6.6.2(3)(c) of the UFTR Technical Specifications, a description of a potential abnormal occurrence as defined in the UFTR Technical Specifications, Chapter 1 is described in this final report to include NRC notification, occurrence scenario and occurrence solutions as well as actions taken to prevent recurrence of this problem. The potential abnormal occurrence involved the failure of one of the UFTR control blades (Safety Blade #3) to drop on demand from a 27-30% withdrawn position.

NRC Notification

The Executive Committee of the Reactor Safety Review Subcommittee reviewed this occurrence on January 28, 1985 and concluded that it is a potential abnormal occurrence as defined in UFTR Technical Specifications, Chapter 1. The RSRS then instructed NRC notification as per Section 6.6.2 of the UFTR Tech Specs. This notification was carried out by both telephone and a following telecopy (Attachment I) on January 28, 1985. An interim report representing the 14 day followup report as required in UFTR Tech Specs, Paragraph 6.6.2(3)(c) was submitted on February 9, 1985 (Attachment II). The current final report records closure of consideration of this occurrence as the problem leading to the occurrence has been shown to be fully resolved.

It should be noted that NRC Region II through Inspector A. Hardin has been kept fully updated as to the progress on the resolution of this problem through telecoms on January 28, January 29, February 19, March 1 and finally on March 6 to advise the final resolution of this problem. In addition, Mr. Hardin was present for an unrelated inspection on February 11-15, 1985 and was advised of the status of the sticking blade at that time.

EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER

Occurrence Scenario

As indicated in the telephone conversation with Mr. Austin Hardin, NRC Inspector, Region II, and a following telecopy on 28 January 1985 (Attachment I), the UFTR had been shutdown (all blades fully inserted) following a brief full power demonstration run on January 26, 1985. As part of a UFTR demonstration exercise following shutdown from full power, Safety Blade #3 was removed to approximately 300 units (30% withdrawn) and the clutch current interrupted to demonstrate the effect of rapid insertion of a large negative reactivity at a far subcritical configuration following shutdown from full power. The blade dropped a few units and failed to drop further. At this point, the operator manually fully inserted the control blade into the UFTR core and notified the Reactor Manager.

Later checks by the Reactor Manager showed that Safety Blade #3 exhibited this sticking phenomenon only over a narrow range from about 27-35% withdrawn. Subsequent checks in the ensuing two weeks showed this sticking phenomenon occurring over a relatively narrow range from about 15-35% withdrawn and not to occur on some occasions. When at the normal position (64% withdrawn) the blade continued to drop properly upon interruption of the clutch current. The same is true of full withdrawal where the drop time continued to be well within the <1 sec technical specification limit in all checks.

As indicated to Mr. Hardin, the need to let the core cool for a period prevented a final report within the 14-day period as it was originally thought that full unstacking of the core could be required to determine the cause of the sticking phenomenon and to resolve the problem if it was within the control blade shrouds inside the core. However, Mr. Hardin did advise the submission of an interim report and recommended including the results of checking all four UFTR control blades to determine whether there was sticking at any other positions. Unfortunately these results were not yet available on February 9 for inclusion in the interim report (Attachment II) due to a failure in a chart recorder required to withdraw blades.

Evaluation

Evaluation and determination of the methods for alleviating this problem of a sticking control blade as well as preventing recurrence were discussed at a staff meeting on January 31, 1985.

Since the UFTR core was unstacked for removal of two fuel bundles for inspection on January 16, 1985, it was thought likely that some slight misalignment of the control blade shaft or the shroud was caused by the activities involved in restacking the shielding. On January 22, 1985, prior to returning the UFTR to service on January 22, all blade drop times were measured and found to be well within tech spec limits. However, Safety Blade #3 did have an increased drop time of slightly over 0.1 sec, not thought to be significant at the time because all blade drop times vary up or down from one check to the next. In addition, the cell radiation levels were surveyed at full power on January 22 prior to returning the UFTR to service. These also were found to be normal.

At the January 31 staff meeting it was decided that potential blade drag points would include:

1. Inside gear boxes
2. Inside the blade shrouds
3. Shifted blade shaft/pedestal or bearing
4. Shifted blade shaft/drive unit or bearing

Also the possibility of mechanical failure due to failed rivets holding the cadmium absorber in the aluminum plates of the control blades was considered but the nature of the sticking made this unlikely. Points 2 and 4 were thought to be most likely in view of the recent shielding removal and work in the core area.

The original work plan involved checking all the above possibilities to determine the cause of sticking in S-3 and to restore proper blade function. As the first stages of ex-core checks on the gear boxes were undertaken, it quickly became evident that the source of binding in the S-3 Control Blade was outside the core region somewhere in the right angle gear box/shaft arrangement. This was initially demonstrated by visually observing the right angle gear box with the blade stuck and noting that load was transmitted at least as far as the gear box indicating the problem was not within the shroud or core area but rather was confined to the right angle shaft-gear box clutch areas.

<u>Review of General Workplan (Corrective Action)</u>

Due to the condition of the bearings on the right angle shaft of control blade S-3 (as well as perceived needs for gear and bearing lubrication and replacement of shim/gasket material at the mating surface of the split-clutch housing) all gears, motors, and clutch assemblies were the subject of a similar maintenance, testing and checkout program following successful completion of all essential work on control blade S-3.

For each of the four control blades, the following general tasks were accomplished:

1. Disconnection of the right-angle gear box from the control blade shaft with the reactor shutdown;

2. Disassembly of the gear box and motor-clutch assembly;

3. Complete cleaning and lubrication of the system components;

4. Replacement of both bearings on the right angle motor drive shaft; although only one bearing on the S-3 shaft was actually malfunctioning, good preventive maintenance dictated replacing both bearings;

5. Replacement of the (cork) shim between the two halves of the clutch assembly housing with aluminum shims to reduce potential compression over time and to assure proper clutch and clutch friction plate clearances; this compression leading to reduced clearances is thought to have contributed to the binding problem;

6. Re-termination of all electrical connections in the shaft housing assembly with new leads to prevent the potential development of contact/corrosion problems;

7. Re-assembly of the right angle gear box and clutch and motor assembly;

8. Re-setting blade drive position potentiometers to read approximately zero for a low level blade position;

9. Re-setting of all limit switches.

Test and Checkout Program

Following completion of the previously referenced tasks for the S-3 Control Blade, a series of tests was performed to assure correction of the problem of the sticking S-3 blade and proper operation of the blade drive control systems to include:

1. Measurement of controlled full removal time;

2. Measurement of controlled full insertion time;

3. Measurement of drop time from full out position;

4. Check for successful drop from five (5) or more intermediate positions.

Initially, control blade S-3 was found to have some clutch slippage during early stages of withdrawal. Investigation of the control blade technical literature indicated that the control blade clutch voltage was rated for use with one-hundred (100) volts across the clutch, or for faster control blade drop times, fifty (50) volts. Practice at the UFTR has been to set the clutch current, not the voltage, allowing circuit impedances to control clutch voltages; clutch voltages were all found to be below technical manual specifications.

Evidence indicates that clearances within the clutch of control blade S-3 were such that some mating friction for control blade motion was provided by the mechanical tolerances. Subsequently, applied voltages were raised to the ranges specified in the technical manual, causing significant current increases (~15%) over previous readings. No further slippage problems were noted. To conform with the specificatons of the technical manual and thus preclude any problems with the remaining control blade drive systems, clutch voltages for Safety Blades S-1 and S-2 were also raised to the ranges specified. Since the clutch voltage for the Regulating Blade was already within the specified range, it was not adjusted.

## Test Results

All control blades were found to have drop times well within the limits of technical specifications and in the case of control blade S-3, the value has dropped to a value intermediate between that recorded in July 1984 and in January 1985 with an average value of 0.644 seconds for three drops. The controlled insertion/removal times are also consistent with normal values - indicating normal operation after setting clutch voltage to specified values. Control blade drops from various positions were also successful in all cases. Test results are summarized in the attached Table 1. Similarly, for comparison purposes, historical data on the controlled removal, controlled insertion and full out drop times for all blades is presented in Table 2. This work was completed on March 2, 1985.

## Recommendation

The UFTR Management presented the results of this work completed on March 2, 1985 to the RSRS for approval on March 5, 1985 to declare the sticking safety blade (S-3) occurrence as a closed issue with resumption of normal UFTR operations allowed. The only potential modification involved in the work is the replacement of the shim material in the split-clutch housing. This potential modification was reviewed relative to its constituting an unreviewed safety question as defined in 10 CFR 50.59 and determined not to constitute an unreviewed safety question by facility management as well as the RSRS Executive Committee. Therefore, the Executive Committee of the RSRS approved restart of the UFTR on March 5. A memorandum from the Director of Nuclear Facilities officially removed the UFTR from Administrative Shutdown on March 7, 1985.

## Preventive Action

The UFTR Technical Specifications Surveillance Requirements, Section 4.2.2 Paragraph (4) states, "The mechanical integrity of the control blades and drive system shall be inspected during each incore inspection but shall be fully checked at least once every 5 years." This requirement dates from UFTR relicensing in 1982 and is considered sufficient to provide reasonable assurances that this binding in the gear/clutch system will not recur since the bearings used are "lifetime" bearings and the gear box and right angle bearing systems have not previously undergone such maintenance.

## Consequences

As concluded by the Reactor Safety Review Subcommittee, this potential abnormal occurence did not compromise the health and safety of the public. In addition, with RSRS approval of this report conveyed to NRC, this problem is considered to be fully resolved.

Postscript

It should be noted that several surveillances which were not performed due to the administrative shutdown since January 28, 1985 following discovery of the sticking blade on January 26, 1985, were required to be performed before normal operations were resumed. These included completion of the annual reactivity measurements as well as an experimental verification that the UFTR has a negative moderator coefficient. This was completed prior to beginning normal operations. In the case of the annual reactivity measurements, the regeneration of control blade integral worth curves was accomplished using the rod drop method in increments of 100 units resulting in up to 10 additional drops for each of the control blades. All were successful. Operations since March 7, 1985 have been normal.

William G. Vernetson
William G. Vernetson
Acting Director of
Nuclear Facilities

26 March 1985
Date

WGV/ps

Enclosures

cc: Reactor Safety Review Subcommittee
P.M. Whaley, Acting Reactor Manager

TABLE 1

TEST RESULTS FOLLOWING UFTR
CONTROL BLADE MAINTENANCE
ON 2 MARCH 1985

A. DROP TIMES FOR 3 DROPS
(Seconds)

| S-1 | S-2 | S-3 | Reg Blade |
|---|---|---|---|
| 0.400 | 0.525 | 0.650 | 0.408 |
| 0.408 | 0.525 | 0.625 | 0.475 |
| 0.400 | 0.517 | 0.658 | 0.517 |

B. CONTROLLED REMOVAL AND INSERTION TIMES

| | S-1 | S-2 | S-3 | Reg Blade |
|---|---|---|---|---|
| Top Position | 1015 | 1004 | 1008 | 1009 |
| Bottom Position | 003 | 003 | 001 | 001 |
| Removal Time (sec) | 105.9 | 106.3 | 108.3 | 108.6 |
| Top Positon | 1015 | 1004 | 1008 | 1009 |
| Bottom Position | 020 | 020 | 018 | 018 |
| Insertion Time (sec) | 103.7 | 103.7 | 105.8 | 106.0 |

C. CLUTCH VOLTAGES AND CURRENTS

| | BEFORE | | AFTER | |
|---|---|---|---|---|
| | VOLTAGE (v) | CURRENT (ma) | VOLTAGE (v) | CURRENT (ma) |
| S-1 | 49.49 | 49.0 | 56.59 | 56 |
| S-2 | 45.8 | 45.4 | 54.99 | 54 |
| S-3 | 46.9 | 42.7 | 64.2 | 52 |
| Reg Blade | 66.92 | 67.0 | No Change | |

Note: Tech Manual Specifies 50-90 v.

Paul M Whaley 3-5-85
Reactor Manager Date

TABLE 2

HISTORICAL BLADE TIMING DATA

A. FULL OUT DROP TIMES (Seconds)[1]

| Date | S-1 | S-2 | S-3 | Reg Blade |
|---|---|---|---|---|
| 2 Mar 85 | .403 (avg) | .522 (avg) | .644 (avg) | .467 (avg) |
| 22 Jan 85 | .450 | .583 | .753 | .450 |
| 24 Jul 84 | .450 | .580 | .525 | .575 |
| 26 Jan 84 | .475 | .550 | .433 | .517 |
| 25 Aug 83 | .425 | .600 | .400 | .483 |
| 21 Mar 83 | .475 | .658 | .458 | .467 |
| 14 Oct 82 | .475 | .658 | .417 | .483 |

B. CONTROLLED WITHDRAWAL TIMES (Seconds)[2]

| Date | S-1 | S-2 | S-3 | Reg Blade |
|---|---|---|---|---|
| 9 Oct 84 | 105 | 105 | 107 | 107 |
| 15 Oct 84 | 106 | 107 | 107 | 108 |
| 22 Oct 84 | 106 | 106 | 108 | 108 |
| 29 Oct 84 | 105 | 106 | 106 | 107 |
| 5 Nov 84 | 105 | 106 | 106 | 107 |
| 11 Nov 84 | 105 | 106 | 108 | 108 |
| 21 Nov 84 | 105 | 106 | 107 | 108 |
| 26 Nov 84 | 106 | 106 | 106 | 108 |

C. CONTROLLED INSERTION TIMES (Seconds)[3]

| Date | S-1 | S-2 | S-3 | Reg Blade |
|---|---|---|---|---|
| 22 Jan 85 | 104 | 104 | 106 | 106 |
| 21 Jan 85 | 104 | 106 | 107 | 108 |
| 31 Jul 84 | 104 | [illegible] | 106 | 107 |
| 26 Jan 84 | 104 | 104 | 106 | 107 |
| 25 Aug 83 | 104 | 104 | 105 | 107 |

Note 1: Data taken from S-2 Surveillance File.
Note 2: Data taken from Weekly Checkout File.
Note 3: Data taken from S-5 Surveillance File.

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W.G. VERNETSON, REACTOR MANAGER
NUCLEAR REACTOR BUILDING
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NUCLEAR FACILITIES DIVISION

UNIVERSITY OF FLORIDA

ATTACHMENT I

January 28, 1985

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, GA 30303

Attention: James P. O'Reilly
Regional Administrator, Region II

Re: University of Florida Training Reactor (UFTR)
Facility License: R-56, Docket No. 50-83

As per telephone call of 28 January 1985, we are reporting the failure of one of the reactor control blades (Safety-3) on the University of Florida Training Reactor to drop on demand from a 27-30% removed position. This failure (sticking at about 27% removed) was discovered during a demonstration when the reactor was shutdown except for the control blade removal in question. The blade was subsequently driven in with no further problems encountered to secure the reactor.

The Executive Committee of the Reactor Safety Review Subcommittee has reviewed the occurrence and concluded that it is a potential abnormal occurrence as defined in UFTR Technical Specifications, Chapter 1. The RSRS has instructed NRC notification as per Section 6.6.2 of the UFTR Tech Specs.

Analysis of the problem is underway with corrective action to follow based upon inspection results. Based on previous experience with a failure of a safety blade (Safety-1) to drop when clutch current was interrupted, February 19, 1975, the problem is probably caused by some misalignment of the control blade system.

William G. Vernetson

William G. Vernetson
Acting Director of Nuclear Facilities
January 28, 1985

cc: RSRS Committee

NILS J. DIAZ, DIRECTOR
W.G. VERNETSON, REACTOR MANAGER
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NUCLEAR FACILITIES DIVISION

UNIVERSITY OF FLORIDA

April 19, 1985

Director, Division of Reactor Projects
United States Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Attention: Roger D. Walker

Re: Inspection Report No. 50-83/85-01
by Inspector A.K. Hardin

Dear Mr. Walker:

This response to Inspection Report No. 50-83/85-01 is divided into two parts. The first part (Attachment A) addresses the sepcific Notice of Deviation citing the UFTR facility licensee for "failure to adequately control and document a revision to the reactor control circuits when on October 2, 1982, an interlock was installed which provided for a trip of the diluting fan/vent fan on activation of the evacuation alarm." Included in this first part of the response is our procedure to assure that modifications are reviewed to determine there are no unreviewed safety questions.

Discussions with Dr. N.J. Diaz (Facility Director) who is on leave this year indicate that this interlock was considered and analyzed on several occasions prior to installation following the June 24, 1980 PuBe source incident referenced in the inspection report (Page 5, Paragraph 14 on Design Changes and Modifications). As a result this modification was considered important enough to be included in the new Tech Specs. As a result the modification was added to the new Tech Specs and in the FSAR on which the new license was issued in August, 1982. As a result this change underwent review and approval within the RSRS as part of the new FSAR and the new Tech Specs. In addition, the modification was reviewed by the SAR site review inspection team in Spring 1982. For these reasons, a 10 CFR 50.59 Evaluation and Determination was not considered necessary; that is, instead of a 50.59 review, the change was included under renewal of the UFTR R-56 License. Therefore, the modification was considered to be adequately reviewed as part of the license renewal process. Nevertheless the documentation of these reviews and the modification itself is not complete and proper corrective action is addressed in Attachment A.

The second part of this response (Attachment B) addresses the procedures and program elements which are used to implement applicable guidelines of ANSI Standard N402-1976. This response describes how the existing UFTR program meets or proposes to meet applicable sections of ANSI Standard N402-1976 and how corrective action is planned to address areas requiring changes such as augmented or new proceudres or other documentation to meet applicable ANSI N402 requirements. All 17 sections (2.1 through 2.17) of the ANSI-N402 Standard are addressed. It should be noted that most of the new procedures or sections thereof committed to be produced are simply better documentation of existing requirements and activities within the UFTR QA Program. We do recognize the need for this documentation and are proceding at a reasonable pace to produce the necessary procedures.

The SOP development required to meet the commitments outlined in Attachment B represents a significant allocation of limited manpower resources. Though we identify specific procedures to be developed to address individual or multiple of the 17 paragraphs of ANSI-N402, better arrangements of SOP contents may be evident later in the development and will be used as deemed necessary without omitting commitments. Commitments themselves are summarized in Attachment C which consists of a table delineating new SOPs or Sections of SOPs to be developed.

The proposed time table to meet these commitments is as follows. As noted in Attachment A, all actions to address the specific cited deviation will be completed by June 30, 1985 with many already completed. The SOP development committed in Attachment B will require much more time. We propose to have these commitments completed and implemented by January 31, 1986. It is expected that this date will provide sufficient time for adequate reviews of SOP drafts to assure development of usable quality procedures.

We trust this response will satisfy the requirements delineated in the inspection report. If there are further questions, please advise.

Sincerely,

William G. Vernetson

William G. Vernetson
Acting Director of
Nuclear Facilities

WGV/ps

Attachments

cc: P.M. Whaley
J.A. Wethington, Jr.

ATTACHMENT A

NRC INSPECTION REPORT NO. 50-83/85-01

## Deviation

Failure to adequately control and document a revision to the Reactor Control Circuits when on October 2, 1982, an interlock was installed which provided for a trip of the diluting fan/vent fan on activation of the evacuation siren.

## Expected Response Content

1. Description of corrective actions regarding these deviations.

2. Actions taken to avoid further deviations.

3. Dates when these actions were or will be completed.

## Management Response

1. Corrective Actions

   The diagrams and drawings for this modification are being put into final form by the UFTR staff. The diagrams and drawings for this modification will then be reviewed for completeness and acceptability by the UFTR staff and then submitted for acceptance and approval by the RSRS to review the installation to assure technical adequacy. This review and approval will be completed by May 30, 1985.

2. Action Taken to Avoid Further Deviations

   a. Prior to approval, all modifications require a 50.59 declaration as per UFTR SOP-0.4 approved by the Reactor Safety Review Subcommittee on March 26, 1985.

   b. A procedure on Control and Documentation of Design Changes is in preparation with completion expected by the end of June with approval by RSRS expected at a regularly scheduled meeting in July, 1985. This SOP will then be approved and installed in all UFTR SOP manuals by July 31, 1985.

3. UFTR SOP-0.4 "10 CFR 50.59 Evaluation and Determination" was approved on March 26, 1985 with official installation into all UFTR SOP manuals expected by April 30, 1985. The basic contents of the SOP have been instituted and utilized beginning with concern expressed at the NRC exit interview on February 15, 1985. The SOP was utilized on March 5 in temporary form to review the maintenance/repair work performed on the UFTR control blade clutch housings.

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NUCLEAR FACILITIES DIVISION

UNIVERSITY OF FLORIDA

ATTACHMENT II

February 9, 1985

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Attention: J. Nelson Grace
Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

Pursuant to the reporting requirements of paragraph 6.6.2(3)(c) of the UFTR Technical Specifications, a description of a potential abnormal occurrence as defined in the UFTR Technical Specifications, Chapter 1 is described in this interim report to include NRC notification, occurrence scenario and proposed solutions. The potential abnormal occurrence involved the failure of one of the UFTR control blades (Safety Blade #3) to drop on demand from a 27-30% withdrawn position.

NRC Notification

The Executive Committee of the Reactor Safety Review Subcommittee reviewed this occurrence on January 28, 1985 and concluded that it is a potential abnormal occurrence as defined in UFTR Technical Specifications, Chapter 1. The RSRS then instructed NRC notification as per Section 6.6.2 of the UFTR Tech Specs. This notification was carried out by both telephone and a following telecopy on January 28, 1985. This interim report represents the required 14 day followup report as required in UFTR Tech Specs, Paragraph 6.6.2(3)(c).

Occurrence Scenario

As indicated in the telephone conversation with Mr. Austin Hardin, NRC Inspector, Region II, and a following telecopy on 28 January 1985 (Attachment I), the UFTR had been shutdown (all blades fully inserted) following a brief full power demonstration run on January 26, 1985. As part of a UFTR demonstration exercise following shutdown from full power, Safety Blade #3 was removed to approximately 300 units (30% withdrawn) and the clutch current interrupted to demonstrate the effect of rapid insertion of a large negative reactivity at a far subcritical configuration following shutdown from full power. The blade dropped a few units and failed to drop further. At this point, the operator manually fully inserted the control blade into the UFTR core and notified the reactor manager.

Later checks by the Reactor Manager showed that Safety Blade #3 exhibited this sticking phenomenon only over a narrow range from about 27-35% withdrawn. When at the normal position (64% withdrawn) the blade drops properly upon interruption of the clutch current. The same is true of full withdrawal where the drop time is well within the <1 sec technical specification limit.

As indicated to Mr. Hardin, the need to let the core cool for a period prevents a final report on this occurrence at this time. However, Mr. Hardin did advise the submission of an interim report and recommended including the results of checking all four UFTR control blades to determine whether there is sticking at any other positions. Unfortunately these results are not yet available due to a failure in a chart recorder required to withdraw blades. When maintenance on the chart recorder is completed, the drop checks from various heights will be checked.

## Evaluation

Evaluation and determination of the methods for alleviating this problem of a sticking control blade as well as preventing recurrence were discussed at a staff meeting on January 31, 1985.

Since the UFTR core was unstacked for removal of two fuel bundles for inspection on January 16, 1985, it is most likely that some slight misalignment of the control blade shaft or the shroud was caused by the activities involved in restacking the shielding. On January 22, 1985, prior to returning the UFTR to service on January 22, all blade drop times were measured and found to be well within tech spec limits. However, Safety Blade #3 did have an increased drop time of slightly over 0.1 sec, not thought to be significant at the time because all blade drop times vary up or down from one check time to the next. In addition, the cell radiation levels were surveyed at full power on January 22 prior to returning the UFTR to service. These also were found to be normal.

At the January 31 staff meeting it was decided that potential blade drag points would include:

1. Inside gear boxes
2. Inside the blade shrouds
3. Shifted blade shaft/pedestal or bearing
4. Shifted blade shaft/drive unit or bearing

Also there is a possible mechanical failure due to failed rivets holding the cadmium absorber in the aluminum plates of the control blades. Points 2 and 4 seem most likely in view of the recent shielding removal and work in the core area.

The work plan will involve checking all the possibilities shown above to restore proper blade function; all control system components involving potential drag points will be so inspected with proper corrective action taken as well. The general work plan will involve measurement of blade drive currents prior to further work to determine if increased motor drag can be detected at the hangup point. The rest of the work plan will involve shielding removal and fuel removal and inspection (as required for mechanical checking of weights of the blades as they are exercised manually) as well as visual and other checks of possibly affected parts of the control system to include gear boxes, shafts, pedestals, shroud and control blades. Alignment and physical integrity will be assured in all cases. Since the core will be unfueled for most of this work, plans are to reload the core and add enough fuel for expected burnup over the next several years.

Consequences

As concluded by the RSRS Executive Committee, this potential abnormal occurrence did not compromise the health and safety of the public. This occurrence was discovered at a far subcritical configuration and would not prevent adequate shutdown margin for the core since the blade can still be driven in and the sticking is 25-30% withdrawn, not a normal operating position.

Followup

Since the work described above will involve approximately two weeks, a further report will be supplied as the exact cause of the problem is determined and addressed.

William G. Vernetson
Acting Director of Nuclear Facilities

WGV/ps

Attachments

cc: F.M. Whaley
Reactor Safety Review Subcommittee

# APPENDIX B

## FINAL SUMMARY REPORT TO NRC ON STICKING S-3 CONTROL BLADE PROBLEM: NOTIFICATIONS, CORRECTIVE ACTION, PREVENTIVE MAINTENANCE, TESTS AND SURVEILLANCES

ATTACHMENT B

UFTR QA PROGRAM TO MEET APPLICABLE SECTIONS OF
ANSI N402-1976

## 2.1 Responsibility

**Existing Program**

The UFTR Quality Assurance Program is established by management directives and implemented primarily by the FSAR facility license and existing manual of Standard Operating Procedures and additional instructions. The memoranda and directives serve to identify structures, systems and components covered by the QA program. Essentially all nuclear safety-related systems, structures and components are covered by the existing Quality Assurance Program.

**Corrective Action**

A specific SOP to formally establish the UFTR QA Program will be generated. The responsibility of UFTR management levels for implementing this program will be delineated in the SOP.

## 2.2 Organization

**Existing Program**

UFTR staff and management personnel are assigned first line responsibility for review, verification and audit functions. The RSRS is assigned final responsibility for review, verification and audit of all modifications to the facility with Nuclear Safety implications. The RSRS is also assigned final audit responsibility for overall facility QA records.

**Corrective Action**

The QA organization will be better defined along with the program responsibilities in the SOP referenced under Section 2.1 (Responsibility).

## 2.3 Documentation

**Existing Program**

As required by ANSI N402, the activities affecting the safety-related items to be covered by the UFTR QA Program are considered to be formally identified within the UFTR SOP manual including SOP-0.1, "Operating Document Controls" and various other SOPs where documentation is delineated. As also required, the documentation includes applicable SOPs, reviews and other applicable measures within the SOP system. There is not, however, a single document wherein all the activities affecting the safety-related

items to be covered by the QA Program are explicitly and formally identified and documented. Essentially to date, all activities required by the Tech Specs, SOPs or other formal documents are considered to be covered by the existing QA program and hence to require documentation.

**Corrective Action**

To assure that all activities affecting the safety-related items to be covered by the UFTR QA program are properly documented, a second procedure will be developed. This SOP will specifically address a QA Program to include documentation previously unspecified applicable procedures, reviews and other measures. With the generation of the procedure, the proper documentation for the entire QA Program will be addressed.

## 2.4 Design Control

**Existing Program**

Adequate design control measures to assure that applicable regulating requirements are correctly incorporated into design documents for safety-related items are in place. As required by ANSI-N402, verifications are performed by independent individuals and modificatons relative to safety-related items are subject to proper design control measures. The requirements of this program element is not well documented. A formal procedure addressing Design Control as currently implemented at the UFTR is the one area of the existing QA program for design control which is lacking.

**Corrective Action**

A separate formal document (a third SOP) addressing applicable design control requirements and recommendations delineated in Paragraph 2.4 of ANSI-N402 will be generated to assure proper design control within the UFTR QA Program. It is not anticipated that this SOP will change UFTR practice in this area - only that it will formalize it to preclude the occurrence of inadequate design control. Existing design control practice is considered adequate, only formalization via an SOP is needed. This SOP is already in development.

## 2.5 Procurement Control

**Existing Program**

The existing UFTR QA Program is considered to have adequate Procurement Control in practice. However, there is no formal SOP to be referenced in this regard. Basically University of Florida procurement control methods are applied with an independent review process to evaluate procured items.

**Corrective Action**

A formal procedure will be generated in which one section addresses procurement control to include measures for addressing requirements in pro-

curement documents for safety-related items as well as adequate quality assurance controls to an extent determined necessary by the safety requirements of the final system. This procurement control section of a procedure will also address changes to procurement documents as well as assurance that procured items or services conform to procurement documents.

## 2.6 Document Control

**Existing Program**

The existing UFTR QA Program contains adequate measures to control the development, revision and use of documents and drawings which define activities affecting the quality of safety-related items. However, there is again no formal SOP to be referenced for overall document control within the QA program. SOPs do exist for controlling procedure changes (SOP-O.1), maintenance and modifications (modification part recommended to be expanded and better delineated by NRC Inspector H. Hardin). Similar document controls are delineated for various other safety-related items and activities by other SOPs such as SOP-A.5 (Experiments), A.1 (Weekly and Daily Checkouts), etc.

**Corrective Action**

A formal distinct procedure will be generated to serve as the overall document control procedure for the QA program. This procedure will establish the overall measures to assure control over the development, revision and use of documents and drawings which define activities affecting the quality of safety-related items.

## 2.7 Material Control

**Existing Program**

Measures established to control the identification, handling, storage, cleaning and preservation of safety-related material and equipment include segregated and controlled storage in several facility locations, labeling as to identity as well as periodic cleaning and wrapping and packaging of items and materials when such treatment is considered necessary.

**Corrective Action**

Only minor changes in the existing program are considered necessary. However, a Quality Assurance procedure will be developed to include a section formally delineating the measures described in the above existing program to include specific locations and types of items (safety-related) involved. This section will be in the same procedure as the Procurement Control elements of the QA program.

## 2.8 Process Control

**Existing Program**

The existing UFTR QA Program contains provisions for establishing and documenting measures to assure that all use of materials for safety-related purposes is accomplished under controlled conditions in accordance with applicable requirements. The existing program is primarily implemented via SOP-O.2 (Control of Maintenance). Certain other procedures also address process control but only indirectly.

**Corrective Action**

No changes to the actual process control part of the QA program at the UFTR are considered necessary. However, a formal distinct procedure will be generated containing a section on process control to serve as the overall process control procedure for the QA Program. This procedure will assure that measures are established and documented to assure quality process control relative to safety-related items and activities in the UFTR facility.

## 2.9 Inspection

**Existing Program**

The UFTR QA Program does contain requirements for inspection of activities affecting quality of safety-related items. As required by ANSI-N402 the inspection program is applied to procurements, maintenance, modification and experiment equipment fabrication. The existing UFTR Inspection program is considered adequate in all areas, though formal delineation of documentation requirements is lacking in the procurement area and to a lesser degree in the modification area. Inspection of experiments is adequately addressed and controlled under SOP-A.5 (Experiments) and inspection of maintenance activities is adequately addressed in SOP-O.2 (Control of Maintenance) which also addresses Modifications but not in sufficient detail. All required aspects of the program are present but formal documentation of requirements is not present via an SOP for areas such as inspection of procurements.

**Corrective Action**

A new UFTR SOP will be developed to establish a formal program for inspection activities in all areas affecting quality of safety-related items. This SOP will not replace SOPs such as O.2 (Control of Maintenance) but will provide overall QA Program Inspection requirements to assure all required areas are addressed with documented results.

## 2.10 Test Control

**Existing Program**

In practice the existing UFTR QA Program incorporates a test program to assure that all required tests of safety-related items are identified and documented. Testing is performed in accordance with written procedures and instructions which incorporate reference requirements and acceptance limits as required. However, there is no single overall test program procedure to assure that all such required tests of safety-related items are identified and documented, though such a check was conducted following relicensing of the UFTR along with issuance of new Tech Specs in 1982.

**Corrective Action**

A new SOP will be developed to delineate all the required tests of safety-related items and to assure formally the completeness of the list of those identified. Because all required tests are considered to have been identified and are being documented as conducted, this SOP will be a formality to assure completeness of the QA Test Program for safety-related items.

## 2.11 Control of Measuring and Test Equipment

**Existing Program**

The existing UFTR QA Program already contains measures established to assure that tools, gages, instruments and other measuring and testing devices used in activities affecting the quality of safety-related items are available, properly controlled, properly and adjusted to meet calibration requirements as necessary. Again this program is not formally documented in an SOP.

**Corrective Action**

Though this program is considered adequate as implemented, a formal procedure will be generated in which one section addresses the Control of Measuring and Test Equipment within the UFTR QA Program for safety-related items and activities. This section will be within the same procedure as the sections developed in reference to Paragraphs 2.5, 2.7, 2.8 and 2.12 of ANSI N402.

## 2.12 Nonconforming Material and Parts

**Existing Program**

The existing UFTR QA Program defined by relevant SOPs and directives etc. is considered adequate to provide for control of materials or parts, involved with safety-related items, which are nonconforming in order to prevent inadvertent use. Again these measures are not specifically ad-

dressed in a separate procedure but a system does exist for proper control, evaluation and disposition of nonconforming material and parts, primarily through SOP-O.2 (Controls of Maintenance).

**Corrective Action**

Though nonconforming material and parts are considered to be adequately controlled in practice, a formal procedure will be developed in which a section addresses the control of such nonconforming material and parts. This section will be within the same procedure as sections developed in reference to Paragraphs 2.5, 2.7, 2.8 and 2.11 of ANSI N402.

## 2.13 Corrective Action

**Existing Program**

Significant conditions detrimental to the quality of safety-related items, such as failures, malfunctions and deficiencies are already promptly identified, causes determined and action taken to preclude recurrence. Through the weekly and daily checkouts delineated in UFTR SOP-A.1, "Pre-Operational Checks" as well as the existing system of tests, checkouts, inventories and surveillances performed to meet License, Tech Spec and SOP requirements, measures exist to assure that corrections are in accordance with design requirements are properly reviewed prior to implementation and are documented.

**Corrective Action**

The new SOP-O.4 delineates how 10 CFR 50.59 Evaluations and Determinations are made. A formal design control procedure is to be generated (see discussions referenced in ANSI-402, Paragraph 2.4) and will assure formal measures exist to control corrections relative to safety-related items to assure they are in accordance with design requirements and are documented for proper QA audit.

## 2.14 Experimental Equipment

**Existing Program**

Experimental Equipment and Experiments in general are adequately controlled for reactor safety considerations via existing UFTR SOP-A.5 entitled, "Experiments."

**Corrective Action**

None required or anticipated.

## 2.15 Quality Assurance Records

**Existing Program**

The existing UFTR QA Program includes documentation of activities affecting quality of safety-related items. The records include results of surveillances, tests and checks delineated in the Technical Specifications and in the UFTR SOP manual as well as the UFTR Security Plan and Operator Requalification Program. In addition records of the independent RSRS audit of facility operations and records are maintained.

**Corrective Action**

All Quality Assurance records will be organized and delineated under a single standard operating procedure to simplify identification and retrieval of records as well as audits to assure ease in tracking completeness. This SOP will also establish retention requirements for all quality assurance records including duration, location and responsibility which essentially will duplicate the requirements delineated in the UFTR Technical Specifications Chapter 6.

## 2.16 Audits

**Existing Program**

Audits of facility records are conducted annually by the RSRS. Though not performed specifically to verify compliance with and determine the effectiveness of (Quality Assurance Program), these audits do in fact serve this purpose since all facets of facility operation are audited. The audits are performed in accordance with written instructions developed yearly by the RSRS Chairman and associated subcommittee members. Results are documented and reported routinely to management; these audits are performed by individuals not having direct responsibilities in the areas being audited. Follow-up action is prescribed where indicated.

**Corrective Action**

A UFTR SOP will be developed and submitted to the RSRS to delineate better the conduct of UFTR audits specific to the UFTR Quality Assurance Program. This formal SOP is not expected to involve little actual change in the audit, merely a formalization in SOP format of what currently constitutes the yearly audit.

## 2.17 Existing Facilities

**Existing Program**

Since the issuance of the new UFTR license addresses the UFTR facility as built at that point, quality assurance documentation for the facility as existing upon relicensing is not required. Since the QA program is cur-

rently undergoing a significant formal delineation as described in this document, quality assurance documentation not required prior to formal delineation is not addressed by this program.

### Corrective Action

All replacements, changes, modifications and activities relative to safety-related items occurring since the relicensing will be reviewed and cleared subject to the QA program requirements committed here and to be addressed via the QA program developments in progress and to be completed by January 31, 1985.

ATTACHMENT C

| ANSI-N402 Paragraphs | Corrective Action (SOP Development Commitments) |
|---|---|
| 2.1 | SOP 1 |
| 2.2 | SOP 1 |
| 2.3 | SOP 2 |
| 2.4 | SOP 3 (Same as SOP committed in Attachment A re the Deviation) |
| 2.5 | SOP 4 |
| 2.6 | SOP 5 |
| 2.7 | SOP 4 |
| 2.8 | SOP 4 |
| 2.9 | SOP 6 |
| 2.10 | SOP 7 |
| 2.11 | SOP 4 |
| 2.12 | SOP 4 |
| 2.13 | SOP 3 |
| 2.14 | None |
| 2.15 | SOP 8 |
| 2.16 | SOP 9 |
| 2.17 | Review of Changes |

Summary: A total of nine (9) new SOPs will be developed, primarily documenting existing QA program elements.

## APPENDIX C

### UFTR STANDARD OPERATING PROCEDURES

1. UFTR SOP-C.1, "ASSEMBLY AND DISASSEMBLY OF IRRADIATED FUEL ELEMENTS"
2. UFTR SOP-O.4, "10 CFR 50.59 EVALUATION AND DETERMINATION"
3. UFTR SOP-E.7, "MEASUREMENT OF TEMPERATURE COEFFICIENT OF REACTIVITY"

UFTR OPERATING PROCEDURE C.1

1.0 Irradiated Fuel Handling

2.0 Approval

Reactor Safety Review Subcommittee . . . . [signature] 2/28/85
Date

Facility Director . . . . . . . . . . . . [signature: William G. Vernetson] 2/28/85
Date

3.0 Purpose and discussion

3.1 This procedure (UFTR SOP-C.1) addresses irradiated fuel handling not considered to be fuel loading (addressed in UFTR SOP-C.2) including:

3.1.1 Removing one fuel assembly from the core, inspecting it in the shield tank, and returning that fuel assembly unaltered to its original position in the core or to a new location in the spent fuel pit;

3.1.2 Removing one fuel assembly from the fuel pit, inspecting the assembly and inserting the assembly into its original position in the spent fuel pit or another position in the spent fuel pit.

3.1.3 No operation which would insert fuel into a core position other than that one position from which that fuel had been removed at a previous point in the procedure.

3.2 Personnel Definitions for Irradiated Fuel Handling Operations

3.2.1 "Supervisor-in-Charge" shall be that person designated by the Reactor Manager to have responsibility for directing the irradiated fuel transfer operation; the Supervisor-in-Charge must hold a Senior Reactor Operator's license.

3.2.2 "Radiation Control Personnel" shall refer to that person or persons with the responsibility for performing radiation field and contamination surveys, establishing and maintaining control points, assuring the provisions of the radiation work permit, and operating radiation detection instrumentation as required to support the operation.

3.2.3 "Equipment Operator" shall be that person or persons who, at the direction of the Supervisor-in-Charge, operates tools and equipment necessary for transfer operations and shall be further divided into categories specifying the equipment to be operated (e.g. crane operator, tool operator, lifting line operator, etc.).

3.3 The operation of fuel assembly removal from the core, inspection, and return to the same location in the core unaltered is accomplished under this procedure; this operation is not considered as Fuel Loading, which is addressed in UFTR SOP-C.2.

4.0 Limits and precautions

4.1 Within 48 hours prior to implementing this procedure, it must be reviewed by all personnel participating in the fuel transfer operation.

4.2 Irradiated fuel transfer operations must be supervised by the Reactor Manager or his duly authorized representative, who shall hold a Senior Reactor Operator License.

4.3 A licensed operator should be at the reactor console at all times during irradiated fuel handling operations; a licensed reactor operator shall be at the console during irradiated fuel handling operations that involve the reactor core.

4.4 Irradiated fuel handling requires a Level I Radiation Work Permit (UFTR SOP-D.2) to be prepared and on site at the work control point.

4.5 Control room documents shall reflect fuel transfer activity.

4.5.1 Operations must be approved in the operating log.

4.5.2 Operating log entries will reflect the nature and status of the fuel transfer operations in progress.

4.5.3 A "Fuel Transfer Log Sheet" (UFTR Form SOP-C.1A) shall be maintained.

4.5.4 An "Irradiated Fuel Handling Duty Assignments Sheet" (UFTR Form SOP-C.1B) shall be maintained in the control room.

4.6 A "Core Loading Diagram" and/or a "Fuel Pit Location Diagram," as necessary, will be available to the Supervisor-in-Charge to enable identification of fuel elements or plates.

4.7 Minimum staffing requirements for fuel transfer operations are as follows:

4.7.1 Supervisor-in-Charge

4.7.2 Radiation Control person

4.7.3 Equipment operator

4.7.4 Control room operator (licensed Reactor Operator)

4.8 Successful completion of the weekly and daily pre-operational checkouts.

4.8.1 Must be verified prior to adding fuel to the core.

4.8.2 Should be verified prior to removing fuel for inspection.

4.9 All necessary neutron and radiation monitoring systems must be in operation.

4.10 The reactor vent system must be in operation for handling irradiated fuel.

4.11 Operations to transfer the fuel cask and/or the fuel will always be performed in a cautious manner, with the full attention of the tool operators directed to the operation in progress; special operational precautions to be addressed include the following:

4.11.1 When the fuel handling tool is properly latched onto a fuel assembly, there will be about 1/2 inch of free vertical movement of the tool before it "clicks" against the lifting lug of the assembly.

4.11.2 When lifting a fuel assembly into the fuel transfer cask, the element must be drawn up by the lifting line until the safety line is taut. Failure to do so can result in damage to the assembly when the cask drawer strikes against the assembly when being closed.

4.11.3 If the fuel handling tool is properly latched onto an assembly, it cannot be operated to release the element; release can only be accomplished by taking the weight of the assembly off the tool by setting the assembly down onto a supporting surface--an attempt to force release may damage the tool.

5.0 References

5.1 UFTR Safety Analysis Report

5.2 UFTR Technical Specifications

5.3 UFTR SOP-A.1

5.4 UFTR SOP-C.2

5.5 UFTR SOP-D.1

5.6 UFTR SOP-D.2

5.7 UFTR Dosimeter Log

6.0 Records required

6.1 UFTR Form SOP-C.1A (UFTR Fuel Transfer Log Sheet)

6.2 UFTR form SOP-C.1B (Irradiated Fuel Handling Duty Assignments)

6.3 UFTR Form SOP-D.2A (Radiation Work Permit)

6.4 UFTR Dosimeter Log

6.5 UFTR Operating Log

7.0 Instructions

7.1 Personnel duties and responsibilities

7.1.1 Supervisor-in-charge

7.1.1.1 Directly supervise the transfer of fuel and remain cognizant of ancillary operations.

7.1.1.2 Verify positive latching of fuel handling tool onto the fuel.

7.1.2 Radiation Control Personnel

7.1.2.1 Set up control point boundaries and those radiation warning signs required by 10 CFR 20, UFTR procedures, the Radiation Work Permit (UFTR form SOP-D.1A), or the Supervisor-in-charge.

7.1.2.2 Maintain the Radiation Work Permit to assure that the requirements set forth in the RWP are being complied with by all personnel in the area controlled by the RWP.

7.1.2.3 Serve as Control Point Monitor as required to monitor personnel entering and exiting the controlled area.

7.1.2.4 Monitor general activity levels as follows:

7.1.2.4.1 Conduct beta-gamma surveys in the core area, the vicinity of the shield tank and around the fuel pit area.

7.1.2.4.2 Take a swipe of the transfer cask drawer following each transfer of fuel; take other swipe surveys as necessary.

7.1.2.4.3 Take periodic air samples in the reactor cell to check for airborne activity.

7.1.2.5 Use a hand held survey instrument to:

7.1.2.5.1 Verify fuel movement into or out of the transfer cask.

7.1.2.5.2 Verify that the fuel handling/lifting tool has disengaged from the fuel to ensure that the fuel is not being withdrawn from the cask as the tool is withdrawn.

7.1.2.6 Maintain radiological records at the direction of the Supervisor-in-Charge.

7.1.3 Equipment operator(s)

7.1.3.1 In general the equipment operator will operate equipment specifically necessary for transfer operations at the direction of the Supervisor-in-Charge.

7.1.3.2 (Tool operator) manipulates the fuel handling tool, and shall verify positive latching and unlatching of the tool from the fuel.

7.2.3.3 (Crane operator) operates the crane as necessary to position and transport the fuel transfer cask.

7.1.3.4 (Lifting line operator) manipulates the lifting tool to:

7.1.3.4.1 Support the fuel handling tool (and thus the fuel) when the fuel transfer cask drawer is being opened or closed.

7.1.3.4.2 Lift the fuel handling tool, and the fuel, when fuel is being drawn up into the fuel transfer cask.

7.1.4 Control room operator

7.1.4.1 Monitor appropriate neutron and radiation instrumentation.

7.1.4.2 Maintain the UFTR Operating Log, the Fuel Transfer Log Sheet (UFTR Form SOP-C.1A), and the Irradiated Fuel Handling Duty Assignment Sheet (UFTR Form SOP-C.1B).

7.2 Preliminary operations

NOTE: For fuel removal from the core, all steps of this Section 7.2 must be accomplished; for fuel removal from the spent fuel pit for inspection, Steps 7.2.5 through 7.2.7 may be omitted; for fuel removal from the spent fuel pit to change the location in the spent fuelpit, Steps 7.2.1 through 7.2.1.3, 7.2.3, 7.2.3.2, and 7.2.5-7.2.7 may be omitted.

7.2.1 Prepare the shield tank to receive fuel for inspection.

7.2.1.1 Remove the shield tank cover.

7.2.1.2 Clamp a guide bar across the shield tank to prevent operations directly over the horizontal through-port.

7.2.1.3 Set up proper lighting to include under-water illumination.

7.2.2 Prepare fuel pits, as necessary, to receive fuel.

7.2.3 Install the neutron source in the core to ensure neutron events are being detected by instrumentation, and assure all necessary radiation monitoring systems are in operation.

7.2.3.1 As a minimum, area radiation and effluent activity monitoring systems required for reactor operation by UFTR Technical Specifications will be operational.

7.2.3.2 As a minimum, neutron monitoring systems required by UFTR Technical Specifications for reactor operation will be operational.

7.2.4 Station the reactor operator at the console.

7.2.5 Unstack reactor shielding sufficiently to permit access to the core.

7.2.6 Place the steel protector plate atop the core area with the guide pins in place.

7.2.7 Bring up reactor primary coolant and remove the magnet power key from the console.

7.2.8 Check that all necessary radiation and neutron monitoring systems are in operation.

7.2.9 Before attempting to handle fuel with the fuel handling tool;

7.2.9.1 Attach a length of safety line from the fuel handling tool to the transfer cask with a snap hook, limiting excessive vertical movement of the fuel.

7.2.9.2 Adjust the length of the safety line so that, with the lifting line pulled taut, a dummy fuel element suspended from the fuel handling tool will hang about 1 inch above the fuel transfer cask drawer.

7.3 Fuel removal from the core:

7.3.1 At the direction of the Supervisor-in-Charge, remove the fuel box shield plug and wedging pin from the fuel box.

7.3.2 Perform a radiation survey as the shield plug is removed; this survey should be performed by radiation control personnel.

7.3.3 Transfer one fuel assembly into the fuel transfer cask as follows:

7.3.3.1 Position fuel transfer cask.

7.3.3.2 Make safety line connection.

7.3.3.3 Make lifting line connection.

7.3.3.4 Latch tool onto fuel and verify positive latching by checking that the tool has about 1/2 inch free movement before "clicking" against fuel lifting lug.

7.3.3.5 Raise fuel into fuel transfer cask by operating lifting line until safety line becomes taut.

7.3.3.5.1 Verify fuel movement into the transfer cask by radiation survey.

7.3.3.5.1 Verify that the fuel bundle is moving freely and not lifting an adjacent bundle by an interference of the assembly nuts and bolts as the element is being raised from the core.

7.3.3.6 Close the fuel transfer cask drawer after verifying that the lifting line is supporting the element so that the safety line is taut--failure to perform this action can result in damage to the fuel element.

7.3.3.7 Disengage and remove fuel handling tool from cask. Verify by radiation survey that the tool disengages.

7.4 Fuel removal from the spent fuel pit:

7.4.1 At the direction of the Supervisor-in-Charge, remove the shield plug from the spent fuel pit position from which the fuel assembly is to be removed.

7.4.2 Position the transfer cask guide over the spent fuel pit location.

7.4.3 Position the plastic guide tube liner on the designated spent fuel pit location.

7.4.4 Position the transfer cask on the guide plate.

7.4.5 Perform Section 7.3.3 of this procedure (UFTR SOP-C.1).

7.5 Fuel inspection

7.5.1 Lower fuel transfer cask cautiously into the shield tank until acceptable radiation levels are established.

7.5.2 Attach safety line from fuel handling tool to shield tank.

7.5.3 Latch the fuel handling tool to the fuel and verify positive latching.

7.5.4 Hold the fuel stationary with the fuel handling tool and use the crane to lower the transfer cask into the shield tank to expose the fuel for inspection.

7.5.5 Position the fuel element by manipulating the fuel handling tool for inspection as required.

7.5.6 Position the fuel back into the transfer cask by using the crane to raise the transfer cask while manipulating the fuel handling tool to assure positioning the fuel in the cask.

7.5.7 Unlatch the fuel handling tool and remove the tool.

NOTE: The weight of the fuel element must be off of the tool before the tool can be unlatched.

7.6 Transferring fuel from transfer cask to spent fuel pit:

7.6.1 Position the plastic guide tube in the upper part of the designated fuel pit.

7.6.2 Position the steel guide plate over designated pit.

7.6.3 Position fuel transfer cask on guide plate.

7.6.4 Make safety line connection.

7.6.5 Make lifting line connection.

7.6.6 Attach (latch) fuel handling tool to fuel assembly and verify positive latching.

7.6.7 Pull lifting line taut.

7.6.8 Open fuel transfer cask drawer.

7.6.9 Lower fuel slowly into designated spent fuel pit.

7.6.10 Unlatch fuel handling tool from fuel assembly and remove tool; verify that the fuel handling tool has disengaged by using a radiation detector to check that the fuel does not rise as the tool is removed.

7.6.11 Make a swipe survey of the transfer cask.

7.7 Reinsertion of irradiated fuel into the core after inspection.

NOTE: It is understood that the operation of removing one fuel assembly from the core, inspecting and returning it unaltered to its original location in the core will not produce an unknown effect on the reactivity of the core; for this reason, controls, prerequisites, and initial conditions of this procedure may be used as the prerequisites while

Section 7.7.2 will be used as the actual procedure for placing an assembly back into its original position in the core following inspection.

7.7.1 Place either the left-handed or right-handed, spring-lipped wooden chute into the fuel box in the desired position.

7.7.2 Position the fuel transfer cask over the chute.

7.7.3 Make safety line connection.

7.7.4 Make lifting line connection.

7.7.5 Attach (latch) fuel handling tool to the fuel assembly and verify positive latching by checking resistance to upward tension.

7.7.6 Pull lifting line taut.

7.7.7 Open the fuel transfer cask drawer.

7.7.8 Use the fuel handling tool to lower the fuel slowly and completely into the fuel box.

7.7.9 Unlatch the fuel handling tool from the fuel assembly and remove the fuel handling tool.

7.7.9.1 Verify that the fuel handling tool has disengaged from the fuel assembly by using a radiation detector to check that the fuel does not rise as the fuel handling tool is removed.

7.7.10 Make a swipe survey of the fuel transfer cask.

7.7.11 Remove the wooden chute from the fuel box.

APPENDIX

FORMS SUPPORTING FUEL TRANSFER

UFTR FORM SOP-C.1A

# UFTR FUEL TRANSFER LOG SHEET

DATE____________

| FUEL ELEMENT/ PLATE NUMBER | REACTOR CORE | | SHIELD TANK | | FUEL STORAGE PITS | | | TIME INTO |
|---|---|---|---|---|---|---|---|---|
| | TIME OUT | TIME IN | TIME OUT | TIME IN | PIT NUMBER | TIME IN | TIME OUT | SHIPPING CASK |
| | | | | | | | | |
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UFTR FORM SOP-C.1B

## IRRADIATED FUEL HANDLING DUTY ASSIGNMENTS

DATE__________

| JOB TITLE | LIST EFFECTIVE TIMES AND PERSONNEL BELOW | | | | |
|---|---|---|---|---|---|
| SUPERVISOR IN CHARGE | | | | | |
| CRANE OPERATOR | | | | | |
| LIFTING LINE UPPER LEVEL | | | | | |
| LIFTING LINE LOWER LEVEL | | | | | |
| TOOL OPERATOR CORE AREA | | | | | |
| TOOL OPERATOR SHIELD TANK | | | | | |
| TOOL OPERATOR FUEL PIT AREA | | | | | |
| RADCON UPPER LEVEL | | | | | |
| RADCON UPPER LEVEL | | | | | |
| CONTROL POINT MONITOR | | | | | |
| CONTROL ROOM OPERATOR | | | | | |
| | | | | | |
| | | | | | |

UFTR OPERATING PROCEDURE 0.4

1.0 10 CFR 50.59 Evaluation and Determination

2.0 Approval

Reactor Safety Review Subcommittee . . . . [signature] 3/26/85
Date

Facility Director . . . . . . . . . . . . . William G. Vernetson 26 Mar 85
Date

3.0 This procedure (UFTR SOP-0.4) addresses the proper review of proposed changes in equipment, systems, tests, experiments or procedures. This procedure assures the proper reviews are obtained in evaluating and making determinations relative to proposed actions to determine whether or not they involve unreviewed safety questions as described in 10 CFR 50.59 and the UFTR Technical Specifications. This review and evaluation will be referred to as a "10 CFR 50.59 Determination" or "Unreviewed Safety Question Evaluation and Determination."

4.0 Limits and Precautions

4.1 The originator of a proposed change in equipment, systems, tests, experiments or procedures should assure that the proposed action is described in sufficient detail to allow proper evaluation as to whether an unreviewed safety question is involved.

4.2 This procedure is intended to address only changes in equipment, systems, tests, experiments or procedures. This procedure does not address normal maintenance operations to include replacement of failed systems or components with identical items.

4.3 Prior to implementation, the proposed changes in equipment, systems, tests, experiments or procedures require review by:

4.3.1 Only UFTR Management (Level 2 and Level 3) provided the answers to all questions in Section 7.3 are negative for two reviewers, both Senior Reactor Operators.

4.3.2 UFTR Level 2 and 3 Management as well as the Reactor Safety Review Subcommittee if the answer to any evaluation question in Section 7.3 is positive.

4.4 UFTR Form SOP-0.4A, "Unreviewed Safety Question Evaluation and Determination" should be used for making all 10 CFR 50.59 determinations.

4.5 The 10 CFR 50.59 Determination shall not be considered complete until all required signatures are obtained on UFTR Form SOP-0.4A along with answers and bases for answers.

4.6 A positive 10 CFR 50.59 determination requires submission of an application to the Nuclear Regulatory Commission for license amendment as per 10 CFR 50.90 before the proposed action can be implemented.

4.7 All outstanding negative 10 CFR 50.59 Evaluations by the UFTR Level 2 and 3 Management shall be reviewed within three (3) months by the RSRS to be considered closed issues.

5.0 References

5.1 10 CFR 50.59

5.2 10 CFR 50.90

5.3 UFTR Safety Analysis Report

5.4 UFTR Technical Specifications

5.5 UFTR Standard Operating Procedures

6.0 Records Required

6.1 UFTR Form SOP-0.4A (Unreviewed Safety Question Evaluation and Determination)

6.2 Reactor Safety Review Subcommittee Minutes

7.0 Instructions

7.1 Requirements for a 10 CFR 50.59 Evaluation and Determination are contained in the documented responses to two sets of questions as delineated on UFTR Form SOP-0.4A to determine whether a proposed action involves an unreviewed safety question.

7.2 Answers to all questions require addressing the basis for the response whether positive or negative. Note that all questions must be answered as affirmative or negative; if any doubt exists, the answer shall be affirmative.

7.3 Questions to be answered for making the 10 CFR 50.59 Evaluation are:

7.3.1 Does the proposed action represent a change in the UFTR as described by the Safety Analysis Report? (Altering the UFTR facilities, systems, or components enumerated, described, or diagrammed in the UFTR Safety Analysis Report)

7.3.2 Does the proposed action represent a change in the procedures described by the Safety Analysis Report? (Access and Key Control in the Reactor Cell, Standard Operating Procedures, Test and Maintenance Procedures, Security Procedures)

7.3.3 Does the proposed action represent a test or other experiment not described in the Safety Analysis Report and not previously performed? (A new experiment, new surveillance)

7.4 Questions to be answered in making the 10 CFR 50.59 Determination are:

7.4.1 Does the proposed action pose an increase in either the probability of or the severity of an accident or malfunction previously evaluated in the Safety Analysis Report? (Failures and malfunctions of components and systems important to safety, nuclear excursions during operation, nuclear excursions during fuel loading, safety-control blade system malfunctions, loss of coolant accident, fission product releases)

7.4.2 Does the proposed action pose the creation of a previously unidentified accident?

7.4.3 Does the proposed action result in the reduction of a safety margin as defined in the bases for the UFTR Technical Specifications?

7.5 If all answers to the 10 CFR 50.59 Evaluation in Section 7.3 are negative, then the 10 CFR 50.59 Determination is negative. A positive (yes) response to any of the questions in Section 7.3 requires that Section 7.4 be completed; a positive (yes) response to any of the 10 CFR 50.59 Determination questions in Section 7.4 then indicates that the proposed action does present an unreviewed safety question.

7.6 If a proposed action is determined to involve an unreviewed safety question or a change in the Technical Specifications, then the proposed action cannot be approved and cannot be carried out as proposed without NRC permission. In this case, the Licensee shall submit an application for amendment of the license pursuant to 10 CFR 50.90, "Application for Amendment of License or Construction Permit."

APPENDIX A

UFTR FORM SOP-0.4A

UNREVIEWED SAFETY QUESTION
EVALUATION AND DETERMINATION

# UFTR FORM SOP-0.4A
# UNREVIEWED SAFETY QUESTION
# EVALUATION AND DETERMINATION

I. Responses to Questions Required for 10 CFR 50.59 Evaluation (See Section 7.3):

| | Response | Basis for Response | | |
|---|---|---|---|---|
| 7.3.1 | ______ | ______________________ | | |
| 7.3.2 | ______ | ______________________ | | |
| 7.3.3 | ______ | ______________________ | | |
| | | | Reactor Manager | Date |
| 7.3.1 | ______ | ______________________ | | |
| 7.3.2 | ______ | ______________________ | | |
| 7.3.3 | ______ | ______________________ | | |
| | | | Facility Director | Date |
| 7.3.1 | ______ | ______________________ | | |
| 7.3.2 | ______ | ______________________ | | |
| 7.3.3 | ______ | ______________________ | | |
| | | | RSRS Chairman | Date |

II. Responses to Questions Required for 10 CFR 50.59 Determination (See Section 7.4):

| | Response | Basis for Response | | |
|---|---|---|---|---|
| 7.4.1 | ______ | ______________________ | | |
| 7.4.2 | ______ | ______________________ | | |
| 7.4.3 | ______ | ______________________ | | |
| | | | Reactor Manager | Date |
| 7.4.1 | ______ | ______________________ | | |
| 7.4.2 | ______ | ______________________ | | |
| 7.4.3 | ______ | ______________________ | | |
| | | | Facility Director | Date |
| 7.4.1 | ______ | ______________________ | | |
| 7.4.2 | ______ | ______________________ | | |
| 7.4.3 | ______ | ______________________ | | |
| | | | RSRS Chairman | Date |

## UFTR FORM SOP-0.4A
## 7.0 INSTRUCTIONS

7.1 Requirements for a 10 CFR 50.59 Evaluation and Determination are contained in the documented responses to two sets of questions as delineated on UFTR Form SOP-0.4A to determine whether a proposed action involves an unreviewed safety question.

7.2 Answers to all questions require addressing the basis for the response whether positive or negative. Note that all questions must be answered as affirmative or negative; if any doubt exists, the answer shall be affirmative.

7.3 Questions to be answered for making the 10 CFR 50.59 Evaluation are:

7.3.1 Does the proposed action represent a change in the UFTR as described by the Safety Analysis Report? (Altering the UFTR facilities, systems, or components enumerated, described, or diagrammed in the UFTR Safety Analysis Report)

7.3.2 Does the proposed action represent a change in the procedures described by the Safety Analysis Report? (Access and Key Control in the Reactor Cell, Standard Operating Procedures, Test and Maintenance Procedures, Security Procedures)

7.3.3 Does the proposed action represent a test or other experiment not described in the Safety Analysis Report and not previously performed? (a new experiment, new surveillance)

7.4 Questions to be answered in making the 10 CFR 50.59 Determination are:

7.4.1 Does the proposed action pose an increase in either the probability of or the severity of an accident or malfunction previously evaluated in the Safety Analysis Report? (Failures and malfunctions of components and systems important to safety, nuclear excursions during operation, nuclear excursions during fuel loading, safety-control blade system malfunctions, loss of coolant accident, fission product releases)

7.4.2 Does the proposed action pose the creation of a previously unidentified accident?

7.4.3 Does the proposed action result in the reduction of a safety margin as defined in the bases for the UFTR Technical Specifications?

7.5 If all answers to the 10 CFR 50.59 Evaluation in Section 7.3 are negative, then the 10 CFR 50.59 Determination is negative. A positive (yes) response to any of the questions in Section 7.3 requires that Section 7.4 be completed; a positive (yes) response to any of the 10 CFR 50.59 Determination questions in Section 7.4 then indicates that the proposed action does present an unreviewed safety question.

7.6 If a proposed action is determined to involve an unreviewed safety question or a change in the Technical Specifications, then the proposed action cannot be approved and cannot be carried out as proposed without NRC permission. In this case, the Licensee shall submit an application for amendment of the license pursuant to 10 CFR 50.90, "Application for Amendment of License or Construction Permit."

UFTR OPERATING PROCEDURE E.7

1.0 Measurement of Temperature Coefficient of Reactivity

2.0 Approval

Reactor Safety Review Subcommittee . . . . . . . [signature] 5/21/85
Date

Director, Nuclear Facilities. . . . . . . . . . . [signature] 5/21/85
Date

## 3.0 Purpose and Discussion

### 3.1 General

3.1.1 As a Limiting Condition for Operation, the UFTR Technical Specifications, Section 3.1 on Reactivity Limitations in Paragraph (3) on Coefficients of Reactivity requires that

> "the primary coolant void and temperature coefficients of reactivity shall be negative."

3.1.2 Furthermore, as a surveillance requirement pertaining to limiting conditions for operation, the UFTR Technical Specifications, Section 4.2.1 on Reactivity Surveillance in Paragraph (2) requires that

> "the temperature coefficient of reactivity shall be measured annually at intervals not to exceed 14 months."

3.1.3 The general method of determining Temperature Coefficient of Reactivity is:

3.1.3.1 Determine a critical position at 1 watt with primary coolant temperature in equilibrium.

3.1.3.2 Heat up the primary coolant to acceptable high temperature for check at a maximum temperature.

3.1.3.3 Cool the reactor down in steps, controlling regulating blade (RB) position to ensure criticality is established for each temperature step.

3.1.3.3.1 Record stable critical Regulating Blade (RB) position at each step.

3.1.3.3.2 Record the corresponding temperature at each step for each stable critical position.

3.1.3.4 Determine and record the reactivity associated with each change in RB position.

3.1.3.5 Determine and record the relationship between temperature deviation from the reference condition and the reactivity change required to maintain criticality at the new temperature.

3.1.3.6 Determine and record the temperature coefficient of reactivity ($\alpha_T$).

NOTE: The previously determined relationship is non-linear, so the value of the temperature coefficient of reactivity will have different values at different temperatures: $\alpha_T$ will be determined by the slope of a line tangent to the previously established relationship.

3.1.4 Acceptable methods of heating primary coolant include:

3.1.4.1 Use of an external electric hot water heater (up to 100 Kw) connected in a closed loop to the coolant storage tank.

3.1.3.2 Cooldown from operation on nuclear heating above the point of adding heat (this method provides higher temperatures for a wider range of possible data points).

4.0 Limits and precautions

4.1 Measurement of the Temperature Coefficient of Reactivity to meet the requirements of this procedure should not be attempted within two days of running the UFTR at power to avoid interference of decaying Xenon-135 levels.

4.2 For external heatup of the primary coolant using an electric hot water heater,

4.2.1 Reactor Manager approval shall be obtained prior to making the connections to the primary coolant system.

4.2.2 The Radiation Control Officer shall be notified prior to making the connections to the primary coolant system.

4.2.3 A Radiation Work Permit shall be in place prior to making the connection to the primary coolant system.

4.2.4 The electric hot water heater should be flushed with demineralized water prior to making the connections to the primary coolant system.

4.3 For nuclear heatup of the primary coolant,

4.3.1 Heatup should be terminated at 3 hours or less to prevent significant Xenon-135 buildup.

4.3.2 Measurements should be taken within 2 hours following termination of heatup to prevent significant Xenon-135 buildup.

4.4 Both methods of heating are equally acceptable for satisfying the Technical Specification, Section 4.2.1, surveillance requirements on the temperature coefficient of reactivity. However, it is recommended that the methods be alternated in successive years and that both methods be employed for comparison verification purposes at intervals not to exceed four (4) years.

5.0 References

5.1 UFTR Safety Analysis Report

5.2 UFTR Technical Specifications

5.3 UFTR SOP-A.2 (Reactor Startup)

5.4 UFTR SOP-A.3 (Operation at Power)

5.5 UFTR SOP-A.4 (Reactor Shutdown)

6.0 Records Required

6.1 UFTR Daily Operations Log

6.2 UFTR Form SOP-E.7A, "UFTR Temperature Coeffficient Measurements Summary"

6.3 UFTR Form SOP-E.7B, "UFTR Temperature Coefficient Data Sheet"

7.0 Instructions

7.1 Heating the primary coolant:

7.1.1 External heat source.

7.1.1.1 Connect the external electric hot water heater.

7.1.1.1.1 A Level Radiation Work Permit is required prior to making the connection to the primary coolant system.

7.1.1.1.2 Reactor Manager approval and Radiation Control Officer notification are required prior to making the connection to the primary coolant system.

7.1.1.1.3 Connections are made through a circulating pump to the primary coolant storage tank drain and fill connections.

7.1.1.2 Locate heater controls at the Reactor Control Console.

7.1.1.3 Secure secondary water.

7.1.1.4 Energize the heater.

7.1.1.5 When the primary coolant temperature has achieved the desired temperature, secure the heater power.

7.1.1.6 Disconnect the heater from the primary coolant system.

7.1.2 Nuclear Heatup:

7.1.2.1 Shift secondary cooling to the city water mode.

7.1.2.2 Start up the Reactor per UFTR SOP-A.2.

7.1.2.3 Proceed to 100 Kw per UFTR SOP-A.3.

7.1.2.4 Maintain power at 100 Kw for sufficient time (at least two hours) to allow primary coolant system temperature to reach a high temperature.

7.1.2.5 Shut the Reactor down per UFTR SOP-A.4.

7.1.2.6 Secure secondary cooling immediately when either:

7.1.2.5.1 The reactor is shutdown, or

7.1.2.5.2 Power level on the wide range recorder indicates less than 500 watts.

CAUTION

If secondary cooling is secured before returning to logic for low power, non-heating operations, the lack of flow will cause a trip. On city water the trip is immediate; on deepwell cooling, the trip has a ten (10) second delay.

7.2 Obtaining data for calculation of Temperature Coefficient of Reactivity with the primary coolant at elevated temperatures.

7.2.1 Start up the reactor to 1 watt per UFTR SOP-A.2.

7.2.2 Mark the 1 watt critical position and temperature on UFTR Form SOP-E.7B.

7.2.3 With the reactor critical at 1 watt, initiate secondary cooling for a short period of time (until temperature is noted to be changing on the 12 point recorder) using the well water cooling supply.

7.2.4 Maintain the 1 watt critical condition by manipulating the regulating blade until coolant temperatures stabilize.

7.2.4.1 Record the stable temperature on UFTR Form SOP-E.7B.

NOTE: Typically, temperature stability will require at least 5 minutes of delay.

7.2.4.2 Record the critical RB position on UFTR Form SOP-E.7B.

7.2.5 Repeat steps 7.2.2 through 7.2.4 until no discernable difference is obtained in the regulating blade position between iterations.

7.2.6 Shut the Reactor down per UFTR SOP-A.4.

7.3 Analysis of data.

7.3.1 On UFTR Form SOP-E.7B, record the reactivity associated with each critical regulating blade noted.

7.3.2 On UFTR Form SOP-E.7B, write in the difference in reactivity between the regulating blade position at each one watt critical position and the regulating blade reference position at the reference lowest value of temperature recorded.

7.3.3 On UFTR Form SOP-E.7B, write in the difference between the temperature at each data point, and the lowest temperature recorded.

7.3.4 On linear graph paper, plot the delta-temperature versus the delta-reactivity of each data point.

7.3.5 On log-linear graph paper, plot the delta-reactivity versus delta-temperature, and extrapolate the delta-reactivity to determine a value over the lower portion of the operating range.

7.3.6 On UFTR Form SOP-E.7A, Step 5, record the temperature coefficient of reactivity ($\alpha_T$) at approximately 80 degrees, 100 degrees, and 120 degrees, as a minimum; record $\alpha_T$ at as many other temperatures as possible.

NOTE: $\alpha_T$ at a given temperature is the tangent to the curve generated in Step 7.3.5 at that temperature. Values of $\alpha_T$ can be determined graphically from the plot by estimating tangents to the curve at the temperatures of interest. Alternately, values of $\alpha_T$ can be determined analytically by determining an equation that best fits the data points, and differentiating that equation with respect to temperature and determining the value of the differentiated equation at the temperature of interest. Either method is acceptable.

7.3.7 Plot the values of the temperature coefficient of reactivity on a curve of $\alpha_T$ versus temperature

7.3.8 Evaluate and compare results of the temperature coefficient of reactivity with previous measurements; record this information on UFTR Form SOP-E.7A.

7.3.9 Assure that all calculations, curves, and Forms SOP-E.7A and SOP-E.7B are complete and proper signatures are included on UFTR Form SOP-E.7A "UFTR Temperature Coefficient Measurements Summary."

# APPENDIX I

## FORMS FOR RECORDING TEMPERATURE COEFFICIENT OF REACTIVITY MEASUREMENTS

# UFTR FORM SOP-E.7A
## UFTR TEMPERATURE COEFFICIENT MEASUREMENTS SUMMARY (A-3)

1. DATE OF LAST MEASUREMENT OF TEMPERATURE COEFFICIENT OF REACTIVITY/CURRENT MEASUREMENT DATE

   Previous:________________ Current:________________

2. BRIEFLY DESCRIBE MEASUREMENT TECHNIQUE (Reference one or both methods of heating discussed in this procedure; note any deviations):

3. RECORD TEMPERATURE/REACTIVITY RESULTS (Use FORM SOP-E.7B):

4. GRAPH TEMPERATURE/REACTIVITY VARIATIONS (Reference Section 7.3.4 and 7.3.5)

5. INITIAL AND DATE TABULAR AND GRAPHICAL RESULTS:

6. RECORD TEMPERATURE COEFFICIENT OF REACTIVITY

| | T | $\alpha_T$ | | T | $\alpha_T$ |
|---|---|---|---|---|---|
| a. | | | e. | | |
| b. | | | f. | | |
| c. | | | g. | | |
| d. | | | h. | | |

6. EVALUATE AND COMPARE RESULTS WITH PREVIOUS MEASUREMENTS:

| Performed by | Date | Rx Mgr/Fac Dir Acknowledgement | Date |
|---|---|---|---|

UFTR FORM SOP-E.7B
UFTR TEMPERATURE COEFFICIENT DATA SHEET

Reference Reactivity Assignment: ______________________ Δk/k

Reference Temperature Assignment: ______________________ °F

| Critical RB Position (Units) | Reactivity Assignment (Δk/k) | Change in Reactivity from Reference Value (Δk/k) | Temp. (°F) | Change in Temp. from Reference (°F) |
|---|---|---|---|---|
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APPENDIX D

UFTR OPERATOR REQUALIFICATION AND

RECERTIFICATION PLAN

(July, 1985 through June, 1987)

UNIVERSITY OF FLORIDA TRAINING REACTOR

OPERATOR REQUALIFICATION AND RECERTIFICATION PROGRAM PLAN

(July 1985 through June 1987)

0. GENERAL

A training program for the periodic requalification of UFTR operators shall be conducted in accordance with the requirements established by this document. The requalification training for UFTR personnel meets or exceeds the requirements established by 10 CFR 55 Appendix A and draft ANSI/ANS-15.4 standard dated September 15, 1977 entitled, "Selection and Training of Personnel for Research Reactors."

Responsibility for the administration of the program shall rest with the Director of Nuclear Facilities of the Department of Nuclear Engineering Sciences and his/her duly designated representative.

All licensed operators are required to participate in all phases of this program except where specifically exempted. Persons in training for an operator's license also participate in the requalification program. An operator receiving a license during a requalification period is required to complete only those portions occurring after the effective date of the license received.

The requalification training program in force at the UFTR shall consist of eight (8) component areas described in the following sections and listed in Table 1. The requirements that must be met in order to complete the requalification program successfully are delineated in these sections.

**Table 1**
**Operator Requalification and Recertification Program Requirement Areas**

1. Requalification Schedule
2. Lectures, Reviews and Examinations
3. Operations and Checkouts
4. Emergency Drills
5. Absence from Authorized Activities
6. Evaluation of Operators
7. Requalification Records
8. Requalification Document Review

## I. REQUALIFICATION SCHEDULE

The UFTR requalification program shall be conducted over a period not to exceed two years and shall be followed by successive two-year programs. To assure that the program is effective, the various requirements shall be executed according to the time schedules outlined in this program guide. The current two-year Requalification Training Schedule (July, 1985 - June, 1987) is contained in Appendix A of this program plan.

## II. LECTURES, REVIEWS AND EXAMINATIONS

### A. Lectures

The requalification program shall be divided into the group of topics listed below in Table 2, for which preplanned training or preparation is scheduled. The schedule is set up so that the entire program covering the topics listed in Table 2 is completed over the two year period.

**Table 2**
**Requalification Training Lecture Program Topics**

1. Nuclear Theory and Principles of Operation
2. Design and Operating Characteristics
3. Instrumentation and Control Systems
4. Reactor Protection System
5. Normal, Abnormal and Emergency Procedures (one per year minimum, independent of emergency drills)
6. Radiation Control and Safety
7. Technical Specifications and Applicable Portions of Title 10, Code of Federal Regulations

### B. Examinations

An examination shall be administered at the end of each lecture session listed in Table 2, no later than two weeks after the lecture or review session. For designated cases, a final examination covering all topics may be substituted for individual examinations. Results of the certified individual's evaluation from the examinations and from the on-the-job training described under Section VI, Paragraph A, "Annual On-the-Job Training," are used to determine the operator's proficiency, weakness or deficiency.

Examination is encouraged but not required for training sessions given but not required by this program.

C. Fuel Handling

Prior to any refueling operation and/or fuel handling operation, a special training session shall be held discussing/practicing the required operations and reviewing procedures to assure proficiency of all personnel involved, including emergency actions.

D. Procedure/Technical Specifications Changes

Any changes in procedures, technical specifications, regulations, as well as any change with safety significance to the facility shall be reviewed by every licensed operator. Furthermore, a written monthly report summarizing the activities in the reactor, including modification, maintenance, results of calibrations and tests, as well as any procedural changes will be distributed to all licensed reactor operators and discussed, as needed.

E. Required Reading List

Documents, letters and memos pertinent to operational safety shall be maintained in the Required Reading List prior to permanent filing. Each operator is responsible for reviewing the list periodically and in a timely manner to remain current with the information contained in the Required Reading List. This reading list will be indexed with a master listing with spaces provided for initials of all required readers. This list should be reviewed at intervals not to exceed one month; when an item has been reviewed, the proper initials should be affixed to acknowledge completion of review.

F. Yearly Review

A yearly review of facility operations, maintenance, modifications, etc. is conducted with the operating staff by the Director of Nuclear Facilities or the Reactor Manager using the UFTR Annual Report as a basis for the review.

III. REQUALIFICATION OPERATIONS AND CHECKOUTS

A. Reactivity Control Manipulations

Over the two year requalification period, each certified individual shall perform at least ten reactivity control manipulations in any combination of reactor startups, shutdowns, or significant reactivity changes.

To insure operator proficiency over a range of ordinary operations, the following schedule of operations and checkouts shall be maintained by all license operators when the reactor is operable.

B. Schedule of Operations and Checkouts

1. Each licensed operator shall perform at least one reactor startup quarterly at intervals not to exceed four months.
2. Each licensed operator shall perform at least one daily checkout quarterly at intervals not to exceed four months.

3. Each licensed operator shall perform at least one weekly checkout semi-annually at intervals not to exceed eight months.

C. Credit for Reactivity Control Manipulations

For the purpose of meeting requalification requirements, each licensed operator and senior operator may take credit only for reactivity control manipulations which they perform themselves.

D. Records

It is the responsibility of each operator to insure that these requirements are met and logged in the operator's Requalification folder. Each operator shall also log monthly operating hours in the same folder.

## IV. EMERGENCY DRILLS

Emergency drills shall be held quarterly. At least once per year these drills shall involve the participation of the University Police Department, the Gainesville Fire Department and other emergency assistance teams as appropriate for the drill in question. Each operator is required to participate in two emergency drills per year at intervals not to exceed eight months. A review of the drill and applicable emergency procedures shall be performed with all certified individuals within seven days after completion of the drill.

## V. ABSENCE FROM AUTHORIZED ACTIVITIES

An operator who has not been actively performing certified functions for a period in excess of four months shall be required to demonstrate to the Reactor Manager or duly authorized representative that his/her knowledge and understanding of the operation and administration of the facility are satisfactory before returning to certified duties. This shall be accomplished through an interview and evaluation or a written, oral or operational examination or a suitable combination thereof. Any deficiencies uncovered must be corrected before the individual resumes authorized functions.

## VI. EVALUATION OF OPERATORS

A. Biennial Evaluations

An in-depth evaluation of the operating performance of each licensed operator shall be performed and documented biennially and/or prior to their re-certification anniversary to insure that they have the knowledge, competence and dexterity to operate the reactor safely and to take appropriate actions in response to abnormal situations that may arise.

The evaluation shall include results from the examinations, the annual on-the-job evaluation of operational proficiency (as delineated under Paragraph B of this Section), and any other available indications of the operator's capability to discharge his/her duties in a safe and competent manner.

B. Annual On-the-Job Training

Each licensed Reactor Operator and Senior Reactor Operator shall demonstrate satisfactory understanding of the operation of the facility systems, operating procedures and facility procedure license changes during an annual walk-through examination administered by a designated Senior Reactor Operator.

C. Grade Requirements

All operators are required to complete each examination satisfactorily according to the following requirements:

1. A grade higher than 80% requires no additional training.

2. A grade in the range of 65%-79% requires additional training in those areas or topics wheere weaknesses or deficiencies are indicated. This training shall be completed within 60 days from the date the examination was administered.

3. With a grade of less than 65%, the individual shall be placed in an accelerated retraining program in those areas where weaknesses or deficiencies are indicated.

   Additional appropriate training requirements in the form of formal lectures, tutoring, self-study or on-the-job training shall be based on the results of examinations conducted.

D. Accelerated Training

Accelerated training programs shall be completed within four months following the grading of the examinations. Furthermore, within one month after the grading of the examination, there shall be an evaluation by the Reactor Manager or a designated representative to determine if the deficiencies uncovered warrant withdrawal of the individual's certification pending completion of the accelerated training program. The evaluation shall consider the individual's past performance record, the supervisor's evaluation and past test scores as well as current deficiencies. An oral exam may also be given to aid in the evaluation. Regardless of the score, if the individual's test indicates a deficiency in a critical area that affects safety, a training program shall be administered to correct the deficiency promptly.

E. Additional Training Requirements

Additional training shall be provided whenever needed to correct weaknesses or deficiencies uncovered. Such additional training shall be completed prior to the conclusion of the specific requalification program or application for renewal of operator's license, whichever occurs first.

F. Additional Evaluation

An evaluation shall be made of an operator at any time his/her physical or mental condition appears impaired in a manner that his/her performance of duties as an operator appears to be affected. Any exemplary performances or additional duties performed by an operator shall be noted in his/her Requalification Folder to aid later evaluations.

## VII. REQUALIFICATION RECORDS

A. Operator Requalification Records

Operator requalification records shall be kept to assure that all the requirements of the "UFTR Operator Requalification and Recertification Program Plan" are met.

Each operator shall have an individual folder containing signature blocks for lectures attended, prepared or assigned self-study sessions, reactivity manipulations performed, weekly and daily checkouts performed, and quarterly drills participated in by the operator. The folder shall also contain copies of written examinations administered, the answers given by the operator, results of any evaluations and documentation of any additional training administered in areas in which an operator has exhibited deficiencies. The performance of, or participation in, special activities such as fuel handling by the individual operator, shall also be logged in the applicable Requalification Folder.

B. Requalification Training Manual

A Master Requalification Training Manual will be used to organize training requirements; this manual shall contain a schedule of all required lectures, reviews, emergency drills, and other exercises. The date the item is performed shall be indicated on this schedule. A section of this manual shall be designated to contain completed training items, attendance sheets, master copies of tests given and lecture outlines if available.

A separate section of this manual shall also indicate license amendment commitments and the dates for each including relicense dates for all licensed operators.

C. Facility Records

Required documents and records pertaining to the Requalification Program shall be maintained at the UFTR as part of the facility records for a period of five years.

VIII. REQUALIFICATION DOCUMENT REVIEW

The individual Requalification Folders shall be reviewed on a semi-annual basis by a designated Senior Reactor Operator and shall be noted by the inclusion of the SROs dated signature. Any deficiencies noted during the review shall be brought to the attention of the Director of Nuclear Facilities or the Reactor Manager who will then insure that appropriate action is taken.

References:

10 CFR 55
American National Standard ANSI/ANS-15.4 - 1977 (N380)

APPENDIX A

UFTR REQUALIFICATION TRAINING SCHEDULE 1985 to 1986

| JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER |
|---|---|---|---|---|---|
| | (L) Design & Operating Characteristics | EMERGENCY DRILL | | (L) Nuclear Theory & Principles of Operation<br>(S) Annual Report Review | EMERGENCY DRILL |

| JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE |
|---|---|---|---|---|---|
| | (L) Normal, Abnormal and Emergency Procedures | EMERGENCY DRILL | (L) Reactor Protection System | (I) Operator Walk-throughs | EMERGENCY DRILL |

* = INVOLVES POLICE, FIRE DEPARTMENT, ETC.

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) = LECTURE

UFTR REQUALIFICATION TRAINING SCHEDULE 1986 to 1987

| JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER |
|---|---|---|---|---|---|
| (L) Instrumentation & Control Systems | (L) Radiation Control and Safety | EMERGENCY DRILL | (L) Technical Specifications | (S) Annual Report Review | *EMERGENCY DRILL |

| JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE |
|---|---|---|---|---|---|
| | (I) Operator Walk-throughs | EMERGENCY DRILL | (L) Normal, Abnormal Emergency Procedures | | EMERGENCY DRILL |

* = INVOLVES POLICE, FIRE DEPARTMENT, ETC.

(P) = PRACTICAL TRAINING (S) = STAFF TRAINING (I) = INDIVIDUAL TRAINING (L) = LECTURE

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# NUCLEAR FACILITIES DIVISION
## UNIVERSITY OF FLORIDA

November 27, 1985

Office of Nuclear Reactor Regulations
Standardization and Special Projects Branch
Director, Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Facility License R-56
Docket No. 50-83

Dear Sir:

In compliance with our Technical Specifications reporting requirements, enclosed is one copy of the 1984-1985 University of Florida Training Reactor Annual Progress Report.

This document complies with the requirements of the UFTR Technical Specifications, Section 6.6.1.

Please advise if further information is needed.

Sincerely,

William G. Vernetson

William G. Vernetson
Acting Director of
Nuclear Facilities

WGV/ps

Enclosure

cc: P.M. Whaley
Acting Reactor Manager

A020
1/1

EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER